IBM z Systems

Backup Strategies for z/VM and Linux on z Systems or LinuxONE

Tracy Dean IBM tld1@us.ibm.com

June 2016



Agenda

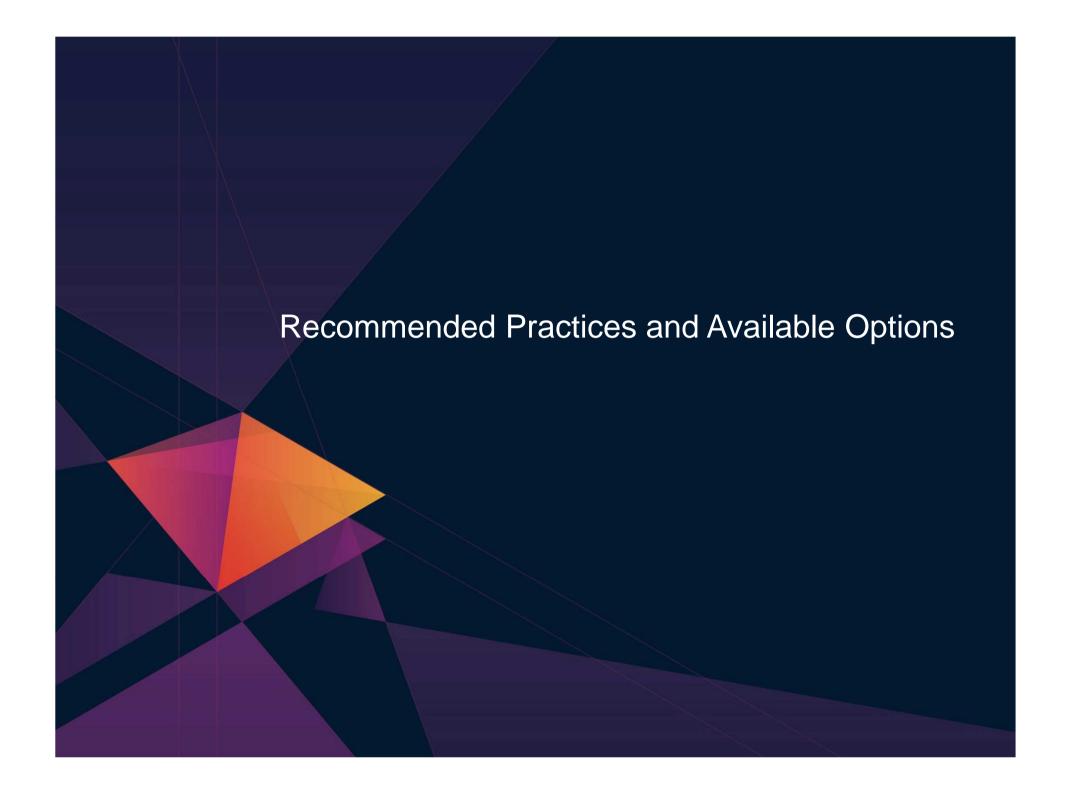
- Positioning
- Recommended practices and available options
- Live demo
 - Including automation to shut down and restart a Linux guest
 - Configuration and sample code
- Summary
- Additional information in handouts for your reference
 - Starting on slide 29
 - Backing up and restoring data in a z/VM SSI cluster
 - IBM Backup and Restore Manager for z/VM
 - IBM Tape Manager for z/VM
 - Additional demos

IBM z/VM Management Solutions

- Security
 - RACF and zSecure Manager for z/VM
- Performance monitoring
 - OMEGAMON XE on z/VM and Linux
 - Performance Toolkit for z/VM
- Backup and recovery
 - Backup and Restore Manager for z/VM
 - Tape Manager for z/VM
 - Spectrum Protect (aka Tivoli Storage Manager)
- Automation and operational monitoring New V1.6
 - Operations Manager for z/VM
 GA May 20
 - Including integration with existing monitoring and alert systems
- Interactive provisioning and system resource management
 - IBM Wave for z/VM

IBM Infrastructure Suite for z/VM and Linux

- IBM bundle/suite
- Tools needed to manage the z/VM and Linux on z Systems infrastructure
 - Wave for z/VM
 - OMEGAMON XE on z/VM and Linux
 - Operations Manager for z/VM
 - Backup and Restore Manager for z/VM
 - Order Tape Manager for z/VM separately if plan to back up to tape
 - Spectrum Protect (aka Tivoli Storage Manager) Extended Edition
- Discounted price as a bundle
- Website:
 - http://www.ibm.com/software/products/en/ibm-infrastructure-suite-for-zvm-and-linux
- DeveloperWorks Wiki Videos of demos
 - http://ibm.biz/Bd4up3



Recommended Practices – Backup and Recovery

Image level backup of z/VM

➤ Operating system

File level backup of z/VM data

- ➤ Directory information
- ➤ Configuration files
- ➤ Log files
- ➤ Tools REXX EXECs, automation scripts, etc.

Image level backup of (some?) Linux virtual servers

- ➤ Operating system
- **≻**Applications
- ➤ Application data (maybe)

File level backup of Linux virtual servers

- ➤ Configuration files
- ➤ Log files
- **≻**Tools

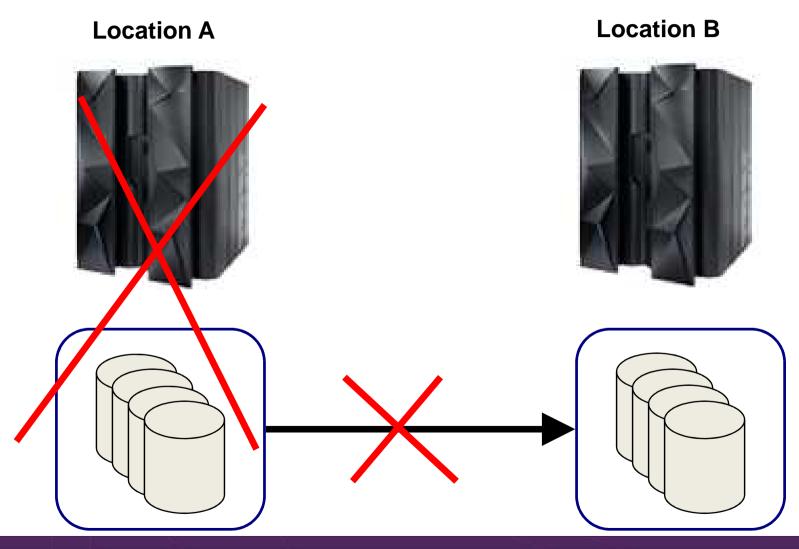
Recovery of z/VM system, including Linux virtual servers

➤ Dependence on z/OS

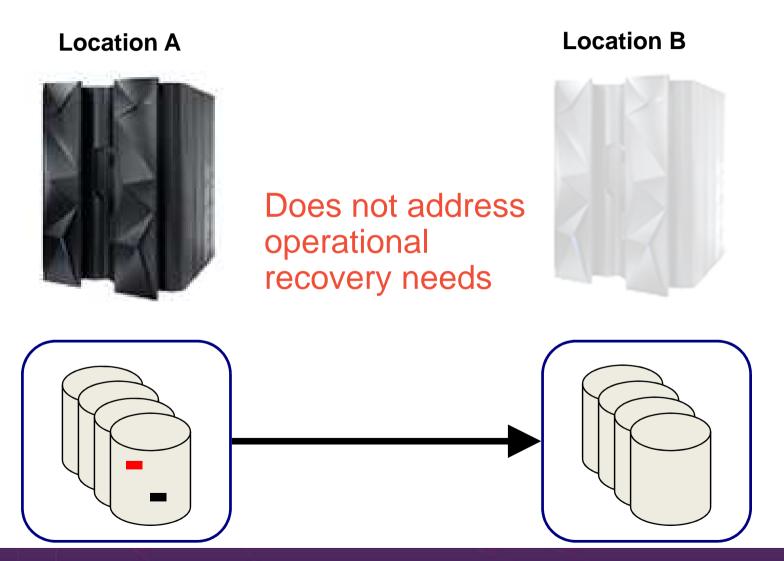
versus

➤ Independent recovery

High Availability



High Availability and Backup/Recovery are NOT the Same



Recommended Practices – Backup and Recovery

Image level backup of the z/VM hypervisor

➤Operating system

File level backup of the z/VM hypervisor data

- ➤ Directory information
- ➤ Configuration files
- ➤ Log files
- ➤ Tools REXX EXECs, automation scripts, etc.

Image level backup of (some?) Linux virtual servers

- ➤ Operating system
- **≻**Applications
- ➤ Application data (maybe)

File level backup of Linux virtual servers

- ➤ Configuration files
- ➤ Log files
- **➢**Tools

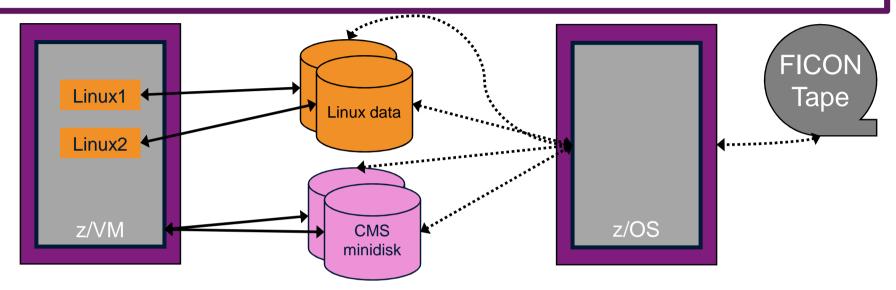
Recovery of z/VM system, including Linux virtual servers

➤ Dependence on z/OS

versus

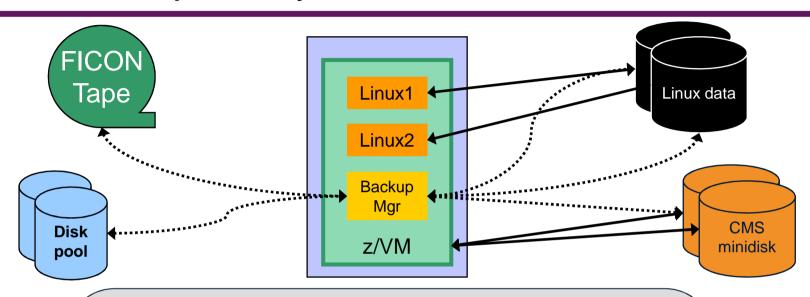
➤ Independent recovery

Image Level Backup/Recovery of z/VM and Linux Virtual Servers from z/OS



- Image level backup and recovery of DASD volumes from z/OS
 - Existing z/OS procedures and tools in place
 - Use existing tape infrastructure
 - Fast
 - Doesn't include FCP-attached DASD
 - Linux should be down
 - Flashcopy can minimize downtime
 - Dependent on z/OS for recovery and DR
 - Is Linux workload critical recovery required in parallel with z/OS in event of disaster?
 - Using z/OS cycles (on general purpose processors) to back up z/VM and Linux

Image Level Backup/Recovery of z/VM and Linux Virtual Servers from z/VM



- Image level backup and recovery of DASD volumes from z/VM
 - Low risk if z/VM is running but not zero risk
 - Includes FCP-attached DASD (defined to z/VM as EDEVICEs)
 - Guest must be logged off if volumes DEDICATEd to guest
 - Linux should be down
 - Flashcopy can minimize downtime
 - Recovery of z/VM and Linux independent from recovery of z/OS
 - Critical Linux workload recovered in parallel with z/OS in event of disaster
 - Faster recovery of z/VM and Linux overall
 - Backup software required on z/VM
 - Use z/VM cycles on IFL processors to back up z/VM and Linux
 - Requires mainframe attached tape devices
 - Share tape devices with z/OS does not require both systems to be up

Do I Need to Perform Image Back Ups of Every Linux Virtual Server?

- It depends ...
- Is each guest image unique?
 - Are logs or other output stored within each guest?
 - Is configuration of each guest automated?
- Can a new guest be recreated from a golden image more easily than restoring it?

Is backing up just the "golden images" sufficient?

Recommended Practices – Backup and Recovery

Image level backup of the z/VM hypervisor

➤ Operating system

File level backup of the z/VM hypervisor data

- ➤ Directory information
- ➤ Configuration files
- ➤ Log files
- ➤ Tools REXX EXECs, automation scripts, etc.

Image level backup of (some?) Linux virtual servers

- ➤ Operating system
- > Applications
- >Application data (maybe)

File level backup of Linux virtual servers

- ➤ Configuration files
- ➤ Log files
- >Tools

Recovery of z/VM system, including Linux virtual servers

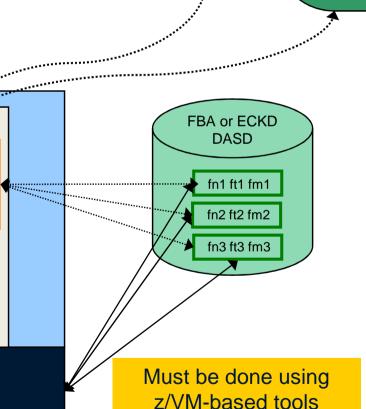
➤ Dependence on z/OS

versus

>Independent recovery

File Level Backup and Recovery of z/VM

- File level backup and recovery of z/VM
 - Low risk if z/VM is running
 - Requires mainframe-attached tape hardware (or DASD)
 - Supports dynamically sharing tape devices with z/OS
 - No need for dedicated tapes devices on z/VM
 - Can be used in addition to image level recovery



Disk

pool

Tape

Recommended Practices – Backup and Recovery

Image level backup of the z/VM hypervisor

➤ Operating system

Image level backup of (some?) Linux virtual

- ➤ Operating system
- > Applications

servers

➤ Application data (maybe)

File level backup of the z/VM hypervisor data

- ➤ Directory information
- **≻**Configuration files
- ➤ Log files
- ➤ Tools REXX EXECs, automation scripts, etc.

File level backup of Linux virtual servers

- ➤ Configuration files
- ➤ Log files
- **≻**Tools

Recovery of z/VM system, including Linux guests

➤ Dependence on z/OS

versus

>Independent recovery

File Level Backup and Recovery of Linux Virtual Servers **FICON** File level backup & recovery of Linux quests using Spectrum Protect (formerly Tivoli Storage Manager) Tape Spectrum Low risk if Linux is running Plugs into existing distributed backup infrastructure **Protect** Includes volumes DEDICATEd to Linux guests Server Requires FCP-attached tape hardware if Spectrum Protect Server is on Linux on z Systems (or a distributed platform) Spectrum Linux on z Systems (or a distributed platform) Protect for Can use FICON-attached tape hardware using Spectrum Protect for **FCP** z/OS z/OS Media Tape Media Can be used in addition to image level recovery: Application/middleware specific clients available (DB2, Oracle, etc.) z/OS FBA or ECKD **DASD** Spectrum **Protect** dirA/file1.ext Server dirB/file2.ext dirC/file3.ext Spectrum Spectrum **Protect Protect** Client Client Other guest Linux Linux Must be done using z/VM Linux-based tools

What About DDR?

- DDR DASD Dump Restore utility in z/VM
- Basic ability to copy data from one location to another
 - Command driven
 - Specify a source location
 - Specify a target location (disk or tape)
- Useful when copying/cloning minidisks or volumes
 - No ability to do file level backup/recovery
 - Be aware of "changing data" on active disks or volumes
- Very limited in terms of production level backup and recovery

What About DDR?

- Advantages of Backup and Restore Manager for z/VM over DDR
 - File level backup and recovery
 - Incremental backups of z/VM (CMS and SFS) files
 - Cataloging of what has been backed up
 - Including full screen interfaces for finding backup data and restoring it
 - Automated expiration processing of catalog data and backup data on disk or tape
 - Flexibility to define a job once using wildcarding
 - Future invocations of that job will back up any new data that meets the criteria
 - Invoke multiple service machines to share the backup task
 - Completes the backup sooner
 - Integration with a tape management system
 - No need to manage tapes and tape mounts manually

Where and How to Back Up z/VM and Linux Guests

- Using z/OS to back up and restore z/VM and Linux
 - Useful during Linux on z Systems POC or early stages of Linux roll-out
 - Easy and fast to implement for existing z/OS customers
 - Provides disaster/volume level recovery (not file level recovery)
 - Concerns or issues long term as Linux workload grows or becomes critical
 - Doesn't support FCP-attached DASD
 - File level recovery of z/VM or Linux data
 - Time consuming and manual
 - Backups only contain volume images
 - In disaster situation, z/VM and Linux must wait for z/OS recovery before beginning their recovery
 - Increased use of z/OS CPU cycles to support z/VM and Linux

Where and How to Back Up z/VM and Linux Guests

- Using native z/VM and Linux solutions for backup and recovery
 - Supports operational errors and disaster situations
 - File level backup and recovery of both z/VM and Linux
 - Image level backup and recovery of FCP and FICON-attached DASD (z/VM and Linux)
 - Independent of z/OS
 - Backups run on (less expensive) IFLs
 - Recovery in parallel with z/OS
 - Dynamically sharing of tape devices with z/OS is still possible
 - Does not require both systems to be up

Backing Up Linux – Should the Guest Be Up or Down?

- Linux keeps pending I/O's in memory when possible
 - Designed for distributed platforms where I/O is assumed to be slow
- Backup solutions that read Linux DASD volumes but run outside Linux don't have a view of these pending I/Os
 - Data on DASD may be in inconsistent state due to pending I/Os
 - Restoring data that has been backed up while Linux is running may not yield usable results
 - SYNC command exists to force all I/Os to be processed
 - Linux will immediately start caching new I/Os
 - Dependent on type of application running on Linux
 - Similar to pulling the plug on a distributed Linux server, then restarting it
 - But worse backup occurs over a period of time
 - DASD A backed up, then while backing up DASD B, DASD A changes again

Backing Up Linux – Should the Guest Be Up or Down?

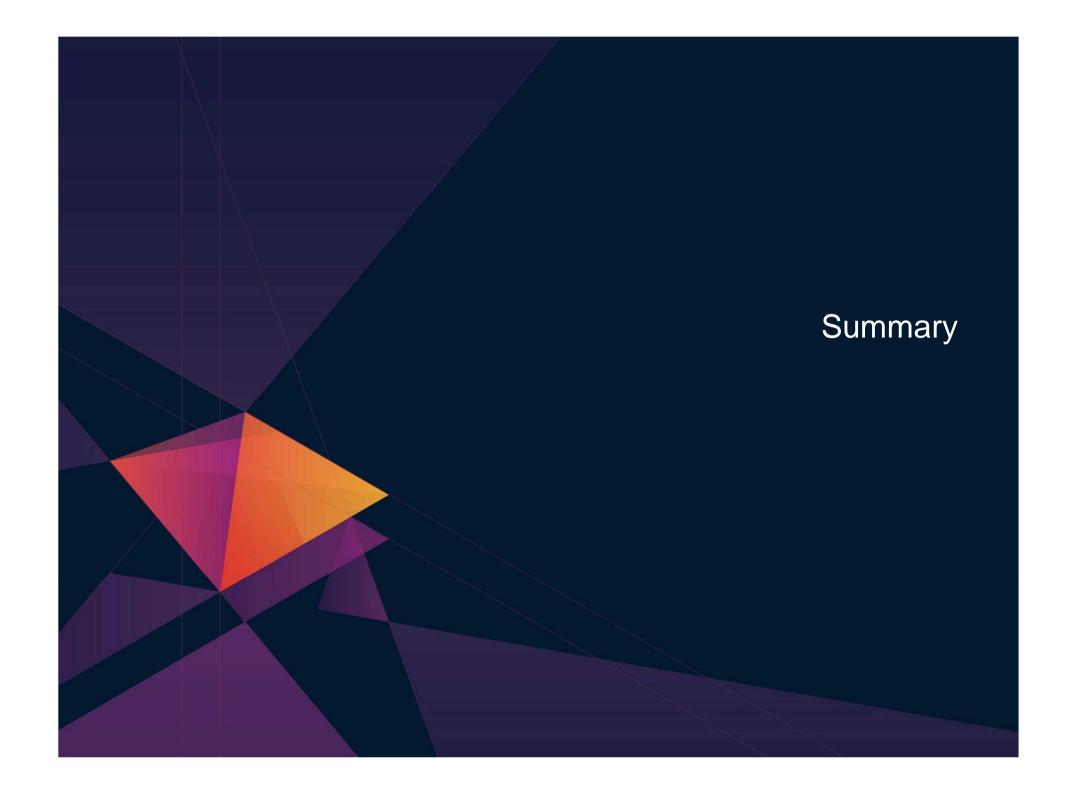
- Reduce risk by
 - "Right-sizing" Linux guests don't give more memory than needed
 - Recommended for performance reasons anyway
 - Using Flashcopy to flash the disks and back up the flashed copy
- For guaranteed recovery, shut down or suspend the guest before backing it up from z/VM or z/OS
 - Your experience may (will) vary
 - Evaluate the risk based on the application
 - Use Flashcopy to reduce the downtime
- Additional notes
 - For DASD volumes DEDICATEd to Linux guests
 - Backups can not be done while guest is running
 - Volume is attached to guest
 - Backups can be done while guest is down
 - Requires some extra steps see upcoming white paper
 - Steps depend on ECKD vs SCSI

Using Suspend Before Backing Up Linux Guests ...

- SUSPEND/RESUME functions available in Linux on z Systems distributions
- Similar to hibernate function in Windows
 - Suspend
 - Completes all pending I/Os
 - Writes memory to disk
 - Resume
 - Detects suspend state
 - Reads memory from disk to restore previous state of the guest
- Requires setup and planning
 - Verify the effort is worth it for each type of guest
 - Otherwise, use shutdown instead of suspend

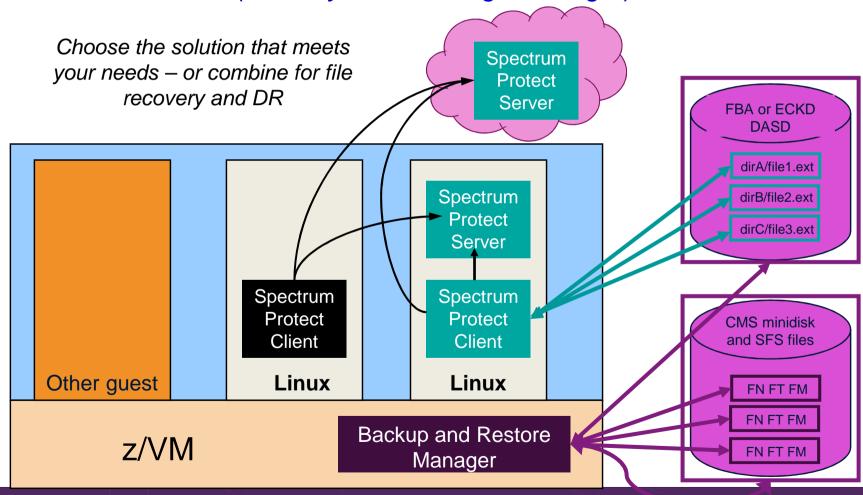
... Using Suspend Before Backing Up Linux Guests

- Setup
 - Specify swap disk in zipl.conf
 - Example: resume=/dev/disk/by-path/ccw-0.0.010f-part1
 - In list of swap disks
 - Specify this one with lowest priority
 - Use real disk (not VDISK)
 - Needs to have enough room for all memory of Linux guest + swap space
- Issue suspend via one of the following:
 - echo disk > /sys/power/state
 - CP SIGNAL SHUTDOWN
 - Must update config file on Linux to specify suspend rather than kill in response to signal shutdown



Summary of Backup Solutions

Using Backup and Restore Manager with Spectrum Protect (formerly Tivoli Storage Manager)



Recommended Practices – Backup and Recovery

Backup Manager

Image level backup of z/VM

➤ Operating system

File level backup of z/VM data

- ➤ Directory information
- ➤ Configuration files
- ➤ Log files
- ➤ Tools REXX EXECs, automation scripts, etc.

Image level backup of (some?) Linux guests

- ➤Operating system
- **≻**Applications
- ➤ Application data (maybe)

File level backup of Linux guests

- ➤ Configuration files
- **≻**Log files
- **≻**Tools

Spectrum Protect

Recovery of z/VM system, including Linux guests

➤ Dependence on z/OS

Back up from z/OS

versus

>Independent recovery

Backup Manager

Reference Information

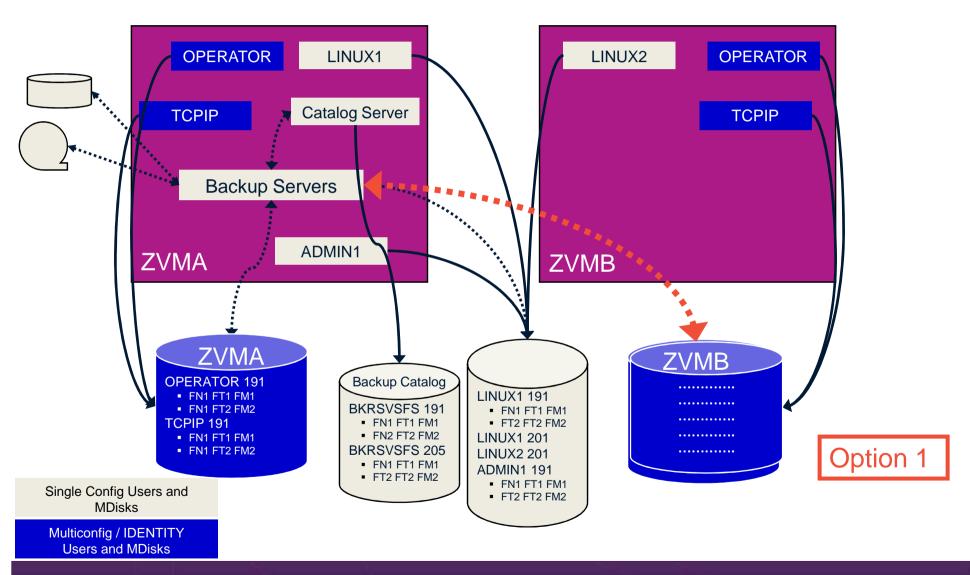
- Product Web site
 - Start at http://www.ibm.com/software/products/en/backup-restore-manager-for-zvm
 - Start at http://www.ibm.com/software/products/en/tape-manager-for-zvm
 - Product pages include
 - Publications
 - Pre-requisites
 - Presentations
 - White papers
 - Support
- e-mail
 - Mike Sine, sine@us.ibm.com, Technical Marketing
 - Tracy Dean, tld1@us.ibm.com, Product Manager
- White papers and presentations on Backup and Restore Manager and Tape Manager websites (Resources tab)
 - Getting Started with Installation, including SFS server creation and installation of Backup Mgr
 - z/VM V6.2 and later
 - z/VM V5.4
 - Backing up z/VM and Linux on System z Tivoli Storage Manager vs Backup Manager
 - Pausing (including SUSPENDing) a Linux Guest
 - Enabling the FACILITY Class for Use by RACF for z/VM

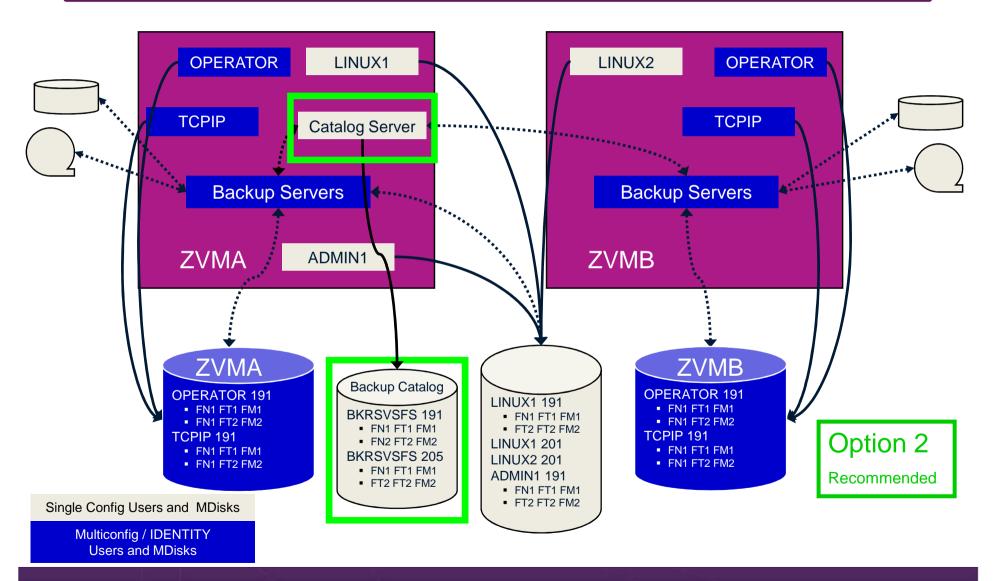
Additional Information

See additional slides in handouts

Backing up and Restoring Data in a z/VM SSI Cluster
IBM Backup and Restore Manager for z/VM
IBM Tape Manager for z/VM
Additional Demos







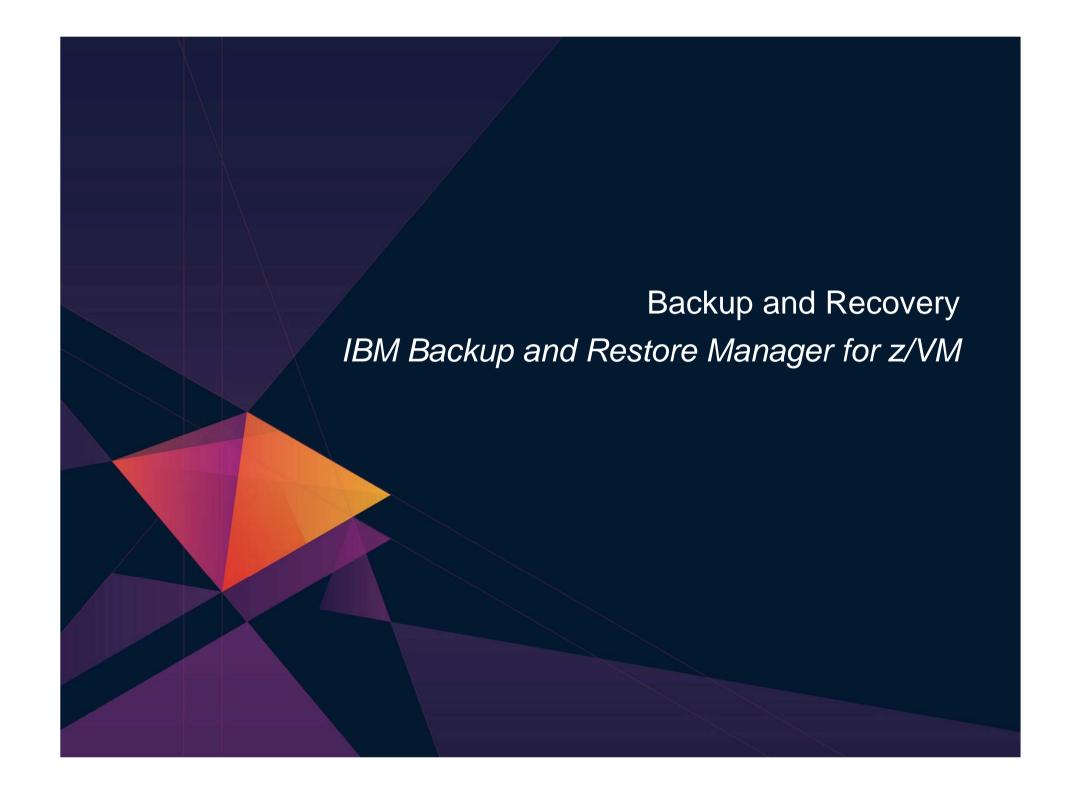
- Backup service machines on any member can see all minidisks of single configuration users
- Backup service machines on any member can see all minidisks of local multiconfiguration (IDENTITY) users
 - Can not see minidisks of IDENTITY users on other members
 - Can only see DASD volumes (if shared/available) of IDENTITY users on other members

Recommendation

- Create Backup service machines as IDENTITY users on each member
 - For IBM Backup and Restore Manager: BKRBKUP, BKRCATLG, BKRWRKnn
- Create one backup catalog for the entire cluster
 - Place the backup catalog in SFS
 - One single configuration user for SFS server/filepool (e.g. BKRSVSFS)
 - Configure as SSI (or REMOTE) in DMSPARMS file
 - Allows admins to see all backup data from all members of the cluster in one view
 - Allows single configuration users to restore their own data when logged onto any member

Recommendation

- Create separate backup jobs for single configuration users vs IDENTITY users
 - Backup job(s) for single configuration users only run them from one member
 - Running them on other members will just back up the same data twice
 - For multiconfiguration (IDENTITY) users
 - One job per member
 - Use a unique job name on each member
 - Run the member specific job on that member's backup server



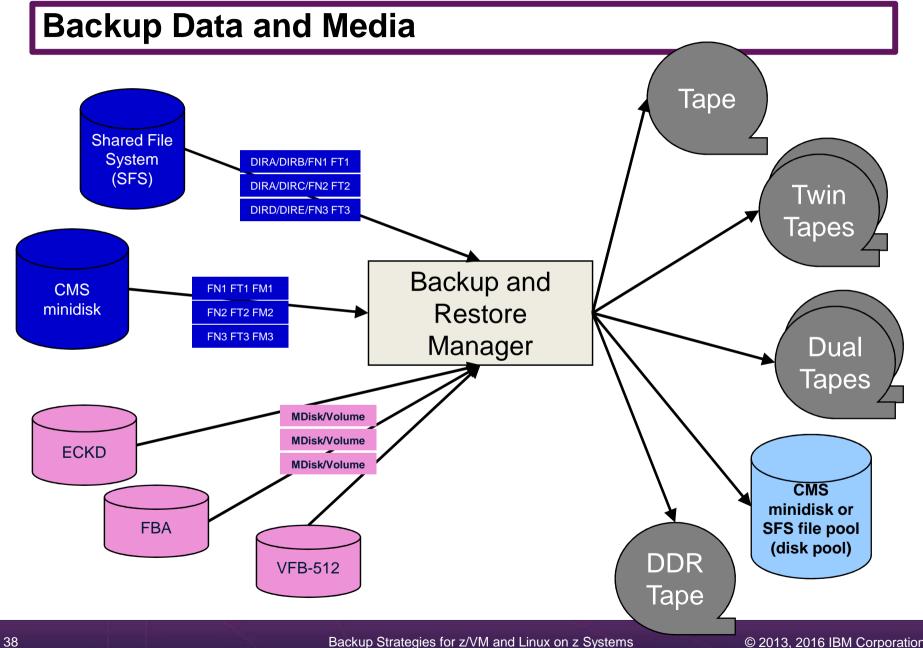
Product Overview

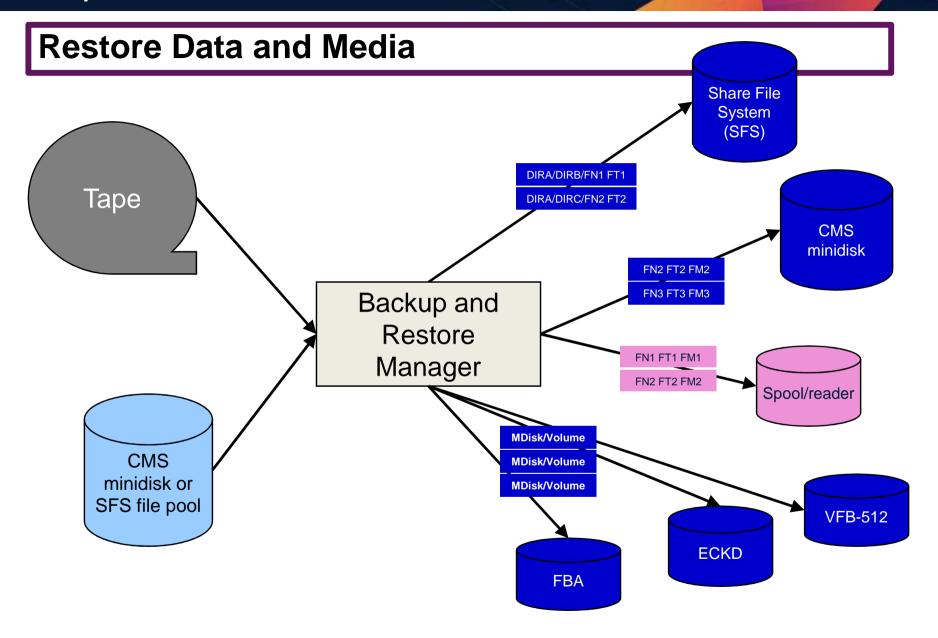
- Backup
 - Requested by administrators
 - Full or incremental
 - Flexible selection of disks and files to back up
 - Review job before submitting for backup

- Restore
 - Restore data via full screen interface or commands
 - Performed by users for their own data
 - Extended to other users available via exit
 - Performed by administrators for any data

Catalog in Shared File System (SFS) – presentation on web site for installation and setup

- Integration with Tape Manager for z/VM
- Optional compression of data during backup via exits
 - Call your own compression algorithm
 - > Use IBM provided routine
- Encryption available via exits
 - Call your own routine
 - Use vendor-written routine, such as V/Soft Software's Encrypt/Backup for z/VM
 - Use encryption capable tape devices





Key Benefits

- System backups available for Disaster Recovery
 - Option to restore using DDR or Backup and Restore Manager
 - Manage retention of DR backups
 - Retrieve a list of tapes associated with a specific backup
 - Pull list for movement to off-site storage
- Guest backups available for restoring to a previous state or level
- Backups of user data available for
 - Restoring to a previous state or level
 - Replacing files accidentally erased or corrupted
- Users restore their own data
 - No administrator interaction required

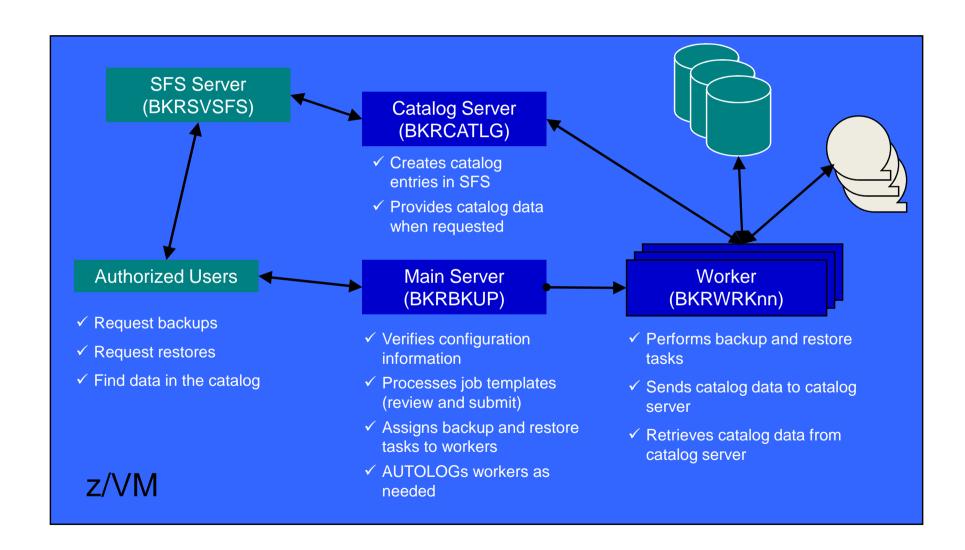
Key Benefits Cont...

- Flexible selection of data to back up
 - Include/exclude
 - Minidisks, SFS directories
 - Real device addresses or volsers
 - Extents
 - Mask by filename, filetype, or SFS path
 - Review a defined backup job before submission
- Management of backup data
 - Retention set as part of the backup job
 - Automatic aging and pruning of the backup catalog
 - Including associated tapes and disk pools (if backed up to disk)
 - View/query the list of expired backups
- Reduced backup window with concurrent processing
 - Multiple worker service machines sharing the job
 - Suggest one worker service machine for each available tape drive
 - Or minidisk in disk pool

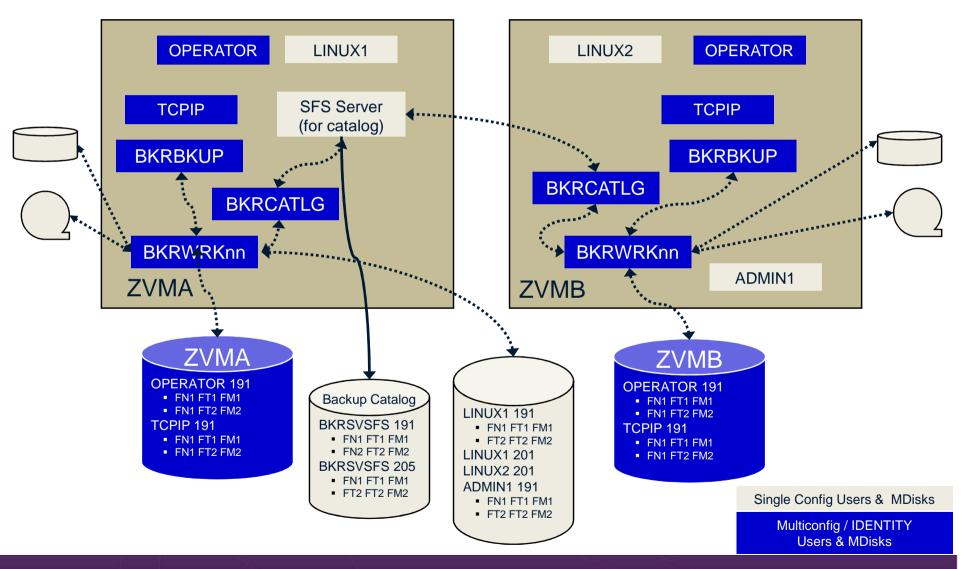
Defining a Backup Job

```
/* Include/Exclude definitions
FUNCTION MEDIATYPE
                   OWNER
                            VDEV VOLUME DEVTYPE
                                                 START
                                                             END
                                                                        SIZE
|-----|----|----|----|-----|--|--|---|---|---|--|--|--|--|--|--|--|
INCLUDE
         MINIDISK
EXCLUDE
         MINIDISK
                  *LNX*
                         = 0123 *
EXCLUDE
         MINIDISK
                  MAINT
                         = 0124 *
EXCLUDE
         MINIDISK
                  MAINT
EXCLUDE
         MINIDISK
                                                        = END
EXCLUDE
         MINIDISK
                                                                     3300
                  MAINT = 012* * *
INCLUDE
         MINIDISK
 FUNCTION MEDIATYPE ADDRESS
-----
INCLUDE
         RDEVICE
                  900-90F
EXCLUDE
         RDEVICE
 FUNCTION MEDIATYPE VOLSER
INCLUDE
                  630*
         RDEVVOL
 FUNCTION MEDIATYPE POOLNAME
                          OWNER
-----|----|----|----|
INCLUDE
         SFS
                  VMSYSU:
                                 SFS
EXCLUDE
         SFS
                  VMSYSU: VMSERVU SFS
```

Backup and Restore Manager Architecture – non-SSI



Backup and Restore Manager Architecture – SSI



Summary

- Use Backup and Restore Manager to
 - Perform file-level backups of z/VM data
 - Perform image-level backups of z/VM volumes and disks
 - Perform image level backups of non-z/VM guest data
 - Use Spectrum Protect for file level backups of Linux
 - Perform disaster recovery backups of entire system
 - Easily find and restore data as needed
 - Automatically manage retention of backup data
 - Carefully plan for SSI configurations



Product Overview

- Manage tapes
 - Define tapes in a catalog
 - Free or used
 - Retention/expiration information
 - ATL/VTS or manual mount
 - Data Security Erase
 - Group tapes together into pools
 - Ownership and access control
 - Media type

- Manage devices
 - Define available devices
 - Dedicated or assignable
 - Group devices together into device pools
 - ATL/VTS or manual mount
 - Any other grouping you choose(read only vs. write, location, etc.)
 - Share devices with other systems
- Manage mount requests
- Volume specific and scratch requests
 - Standard Label
 - Non-Label
 - Bypass Label Processing

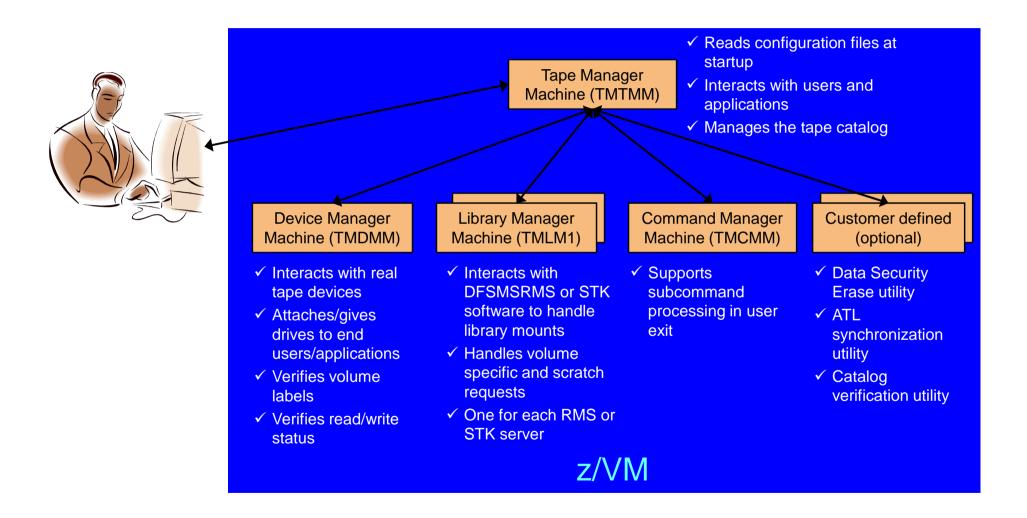
Key Benefits

- Effective management of tapes in ATL or VTS
 - Granular access control
 - Expiration processing
 - Notification for low threshold for tape resources
 - IBM libraries supported through DFSMSRMS on z/VM
 - STK libraries supported through STK Host Software Component for VM, or STK VM Client
 - EMC libraries supported through standard CCW interface
- Improved accuracy of manual tape processing
 - Granular access control
 - Automated interface to Operator for manual mounts
 - Internal label verification at attach/give and detach (SL only)
 - Read/Write verification at attach/give
- Integrated management of z/OS and z/VM tapes using DFSMSrmm on z/OS
 - Optionally use RMM on z/OS as the tape catalog for z/VM and z/OS tapes
 - Tapes, access control, and retention managed by the existing RMM catalog
 - Accessible via Tape Manager on z/VM
 - Tapes managed by RMM
 - Devices managed by Tape Manager sharing devices with z/OS is discussed later
 - Not available for STK libraries

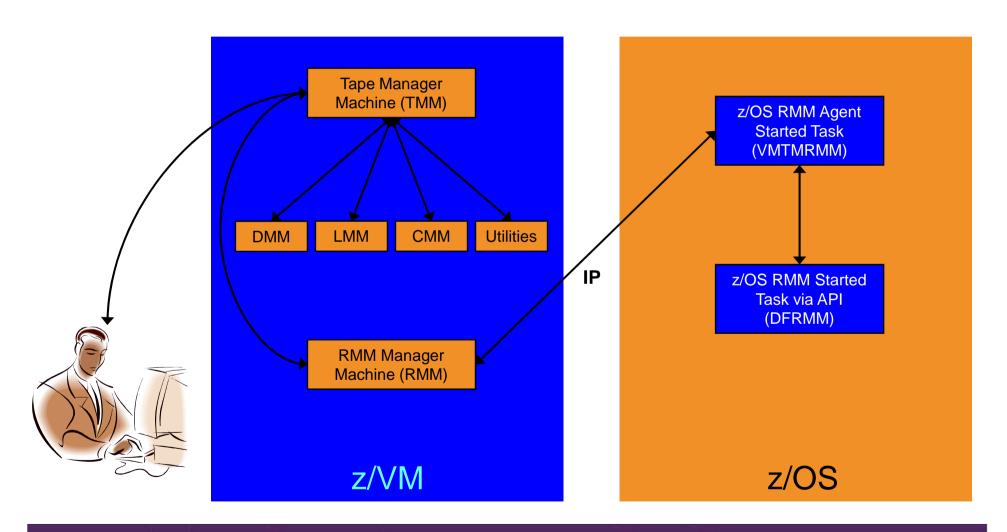
Data Security Erase (DSE)

- Erase (sensitive) data before tape is reused
- Option to enable DSE at tape pool or individual tape level
 - DSE-enabled flag included in each catalog entry
- DSE-enabled tapes marked as DSE-ready when freed
- Tape Manager DSE utility (TMDSE) executed on a separate user ID
 - Started manually or automatically with Operations Manager
 - Queries the catalog to find all tapes with DSE-ready flag on
 - Mounts each tape
 - Verifies volume label if possible
 - Configuration option to perform DSE on NL tapes or not
 - Erases tape
 - Turns off DSE-ready flag in catalog
 - Tape is now available for scratch unless its HOLD flag is on

Tape Manager in Standard Mode



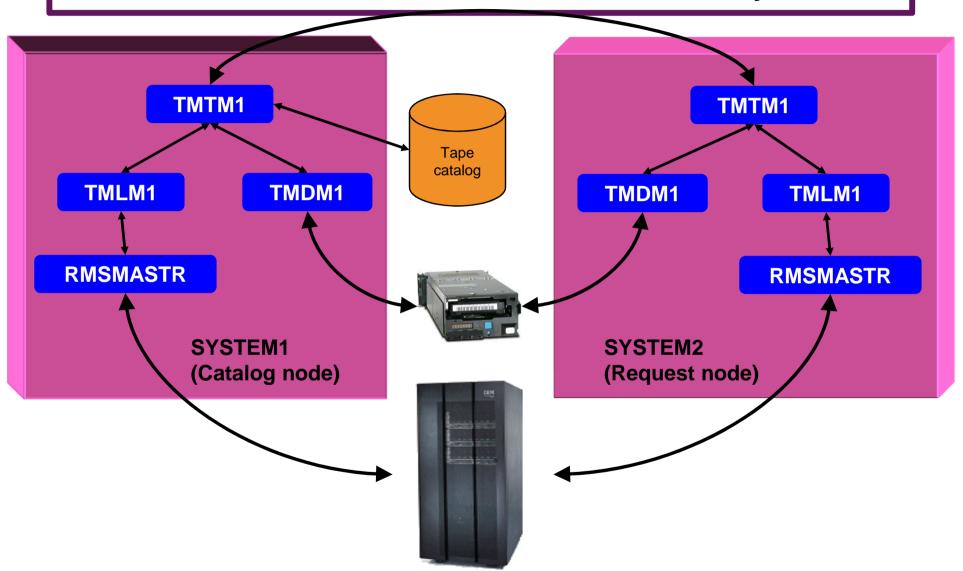
Tape Manager in RMM Mode



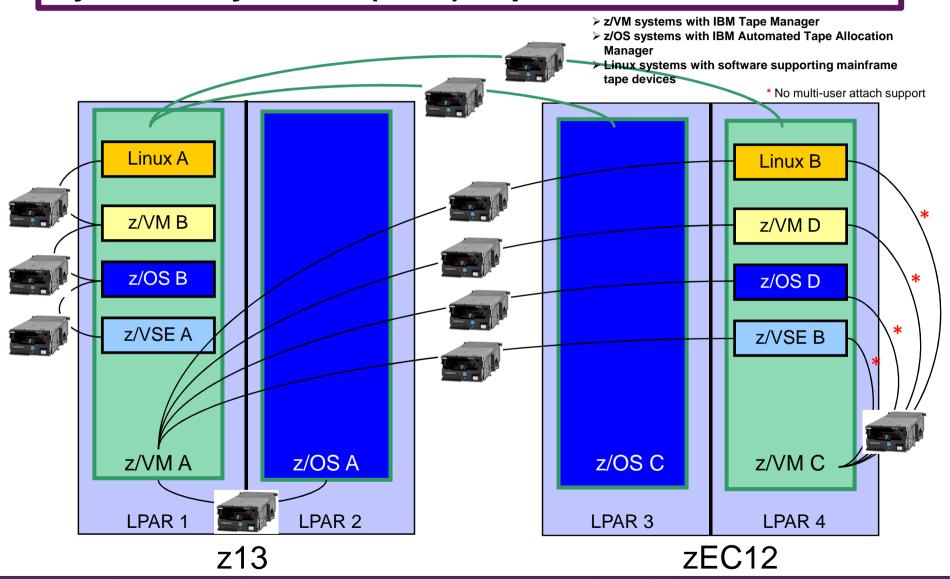
Support for One Tape Catalog Across Multiple z/VM Systems

- One "catalog node"
 - Responsible for the tape catalog contents
- Multiple "request nodes"
 - Manage requests on the local system
 - Communicate with catalog node to read or update catalog data
- One catalog used by multiple z/VM systems
 - No longer need to create a catalog on each z/VM system, each with its own range of volsers
 - All z/VM systems share one catalog
- IP used for communication between systems

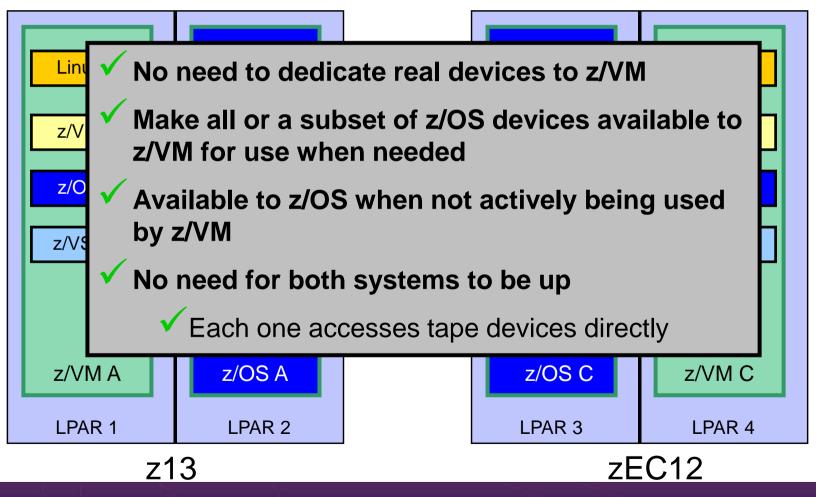
Communication Between Service Machines and Systems



Dynamically Share (Real) Tape Devices

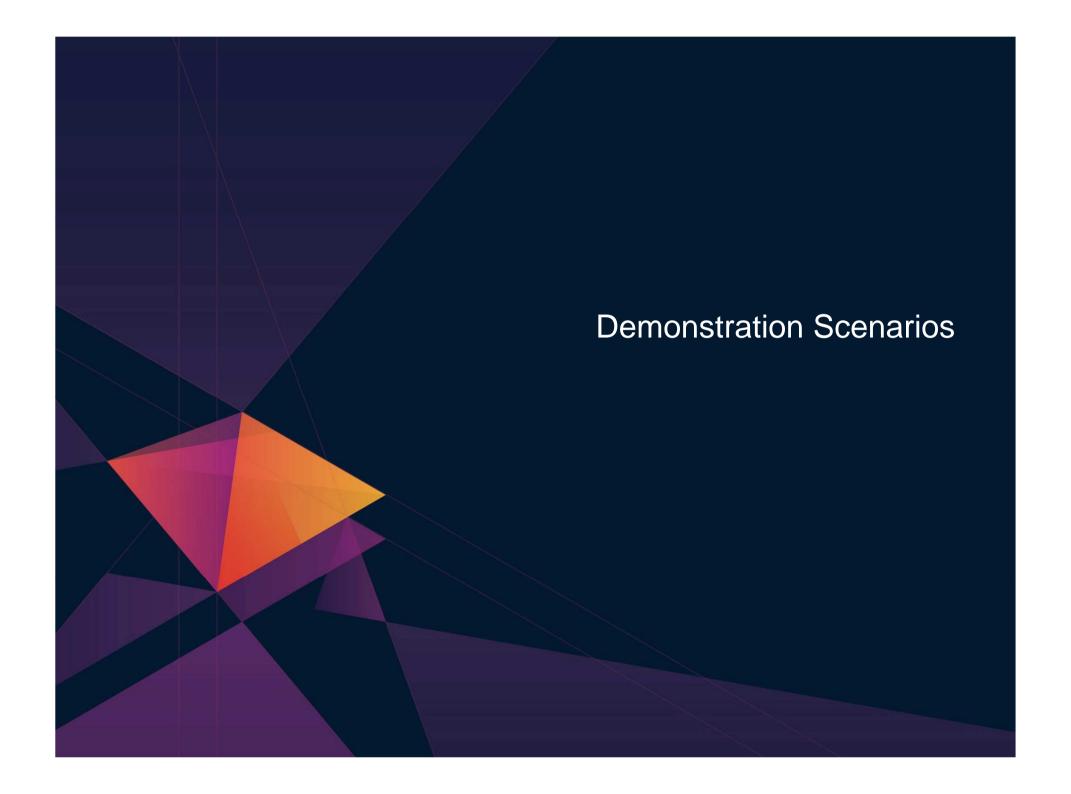


Dynamically Share (Real) Tape Devices



Tape Manager for z/VM - Summary

- Use Tape Manager to
 - Manage and share devices
 - Manage tape volumes
 - Access control
 - Retention
 - Data Security
 - Improve accuracy of mount requests



Backup and Recovery – Demos Available

- A. Performing an incremental backup
- B. Restoring files from backup
- C. Back up and restore single and multiconfiguration users in an SSI environment
- D. Scheduling image backups of Linux guests
- E. Suspend and resume a guest as part of backup
- Reviewing a disaster recovery backup
- G. Reviewing data in the backup catalog for recovery

Scenario A: Performing an Incremental Backup

- Administrator previously performed a full backup
- Incremental job defined, using last full backup as its base
- Change a file on user's A-disk
- Submit incremental job for review
- Submit incremental job for backup processing
- Use Operations Manager to monitor backup servers

Scenario A: Detailed Steps

From a z/VM user ID, change a file

xedit b b a

 From an authorized z/VM user ID, submit a backup job for review

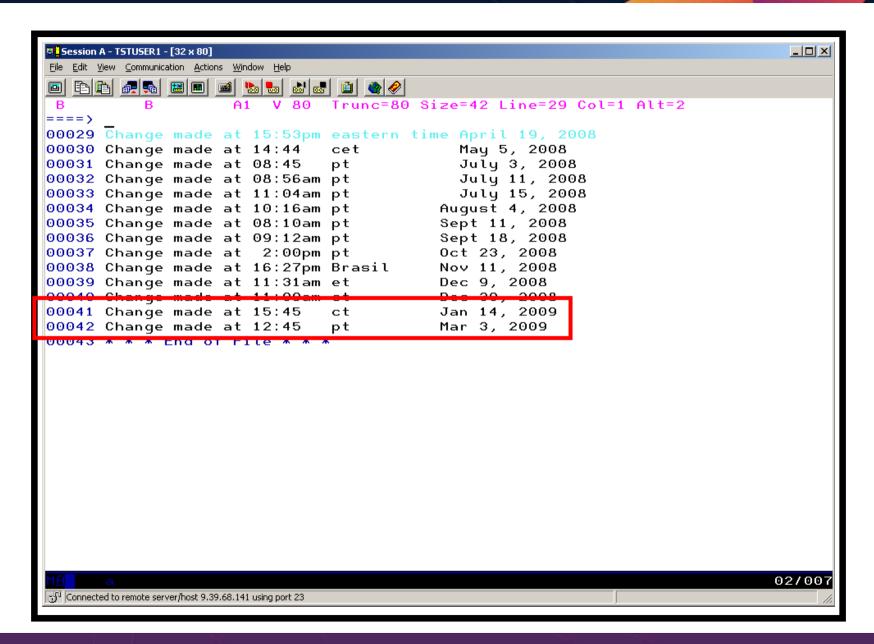
smsg bkrbkup review increm01

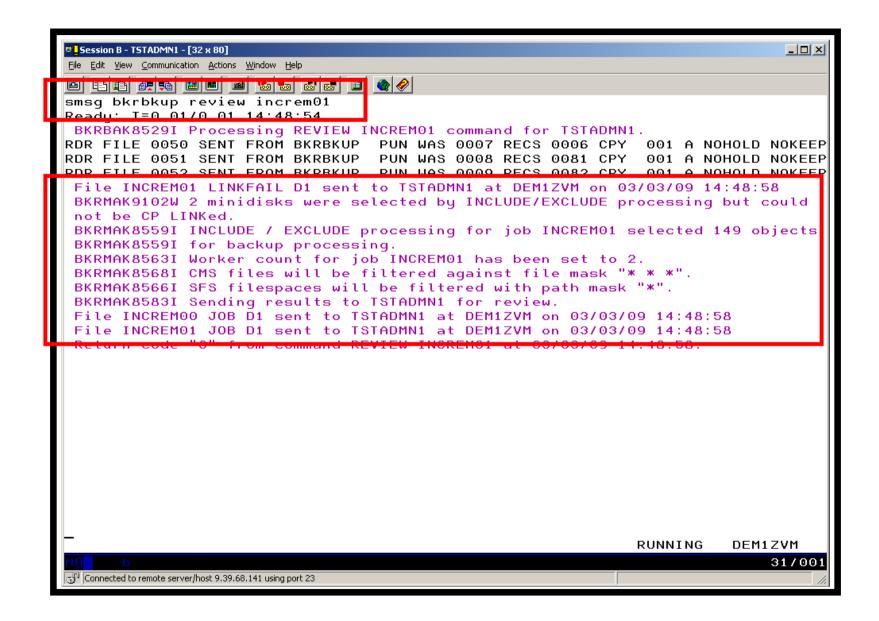
- Review the resulting files in the reader (LINKFAIL and JOB files)
- From an authorized z/VM user ID, submit a backup job for backup processing

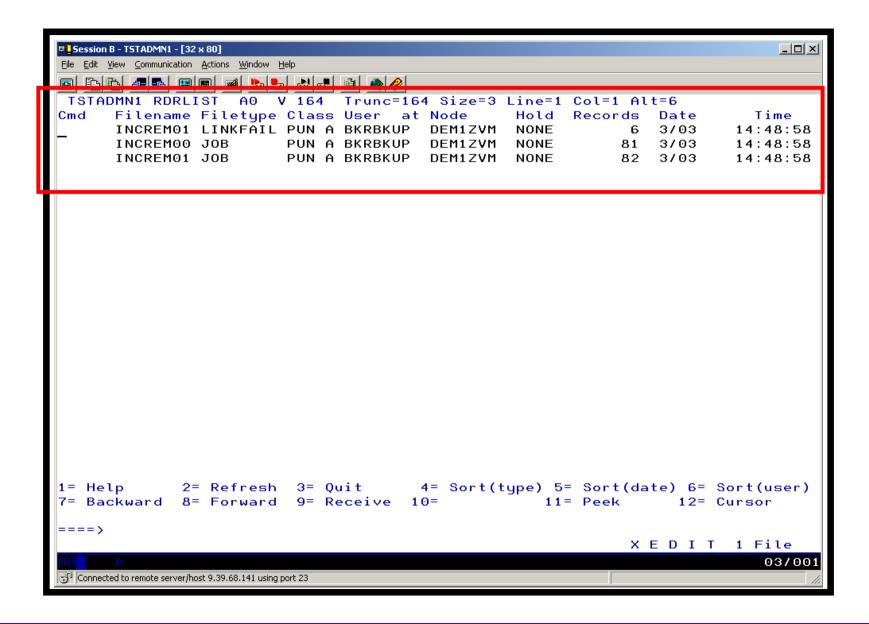
smsq bkrbkup submit increm01

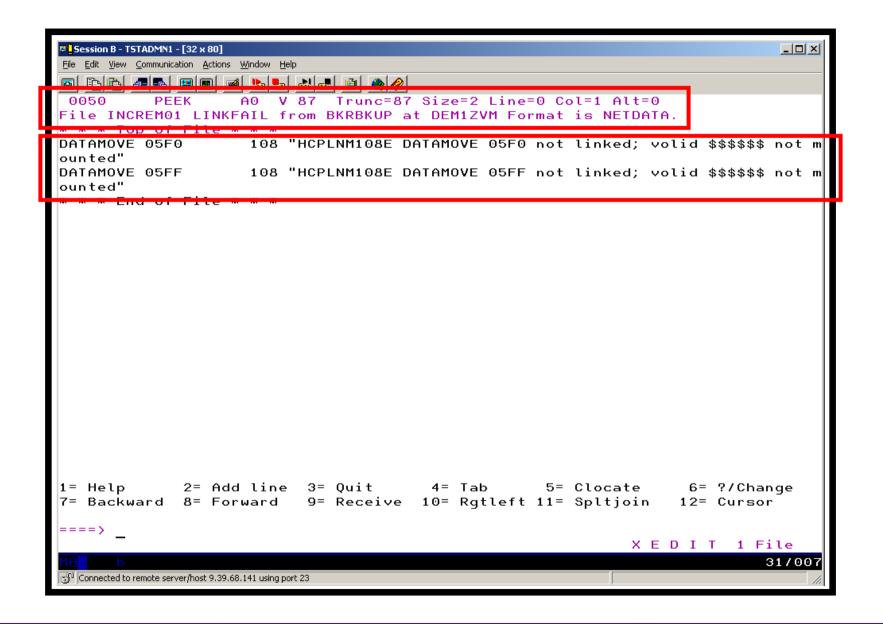
View the console of the backup servers to see the processing

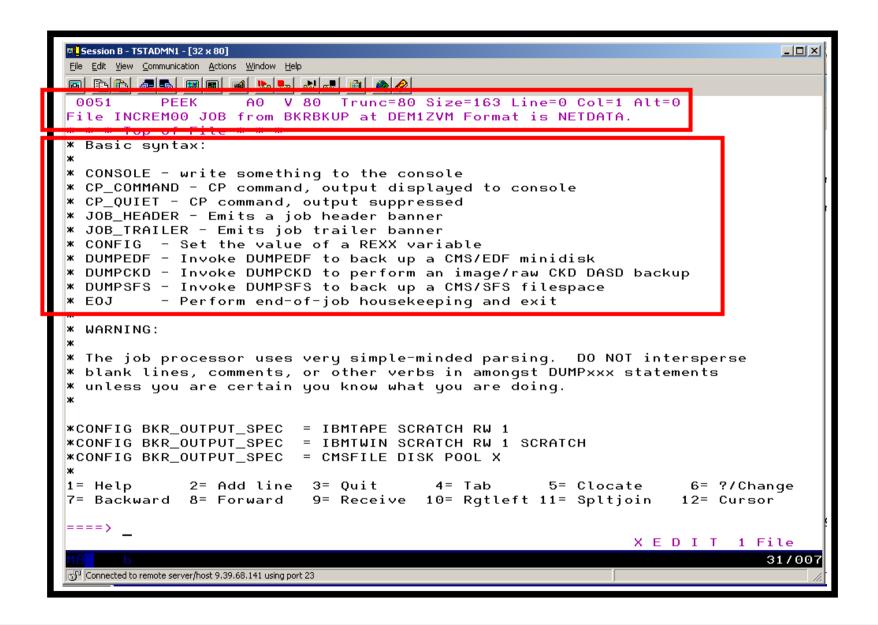
gomcmd opmgrm1 viewcon user(backup)

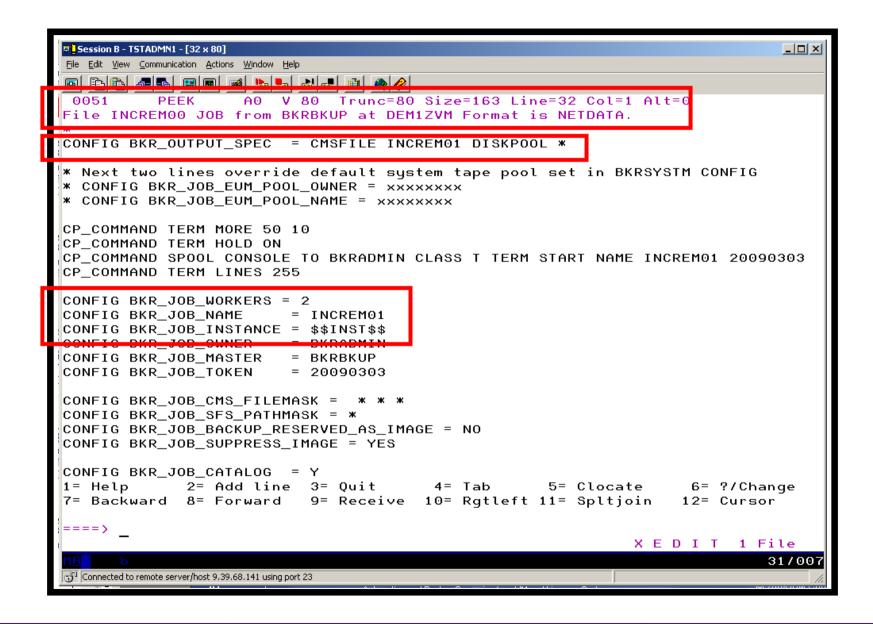


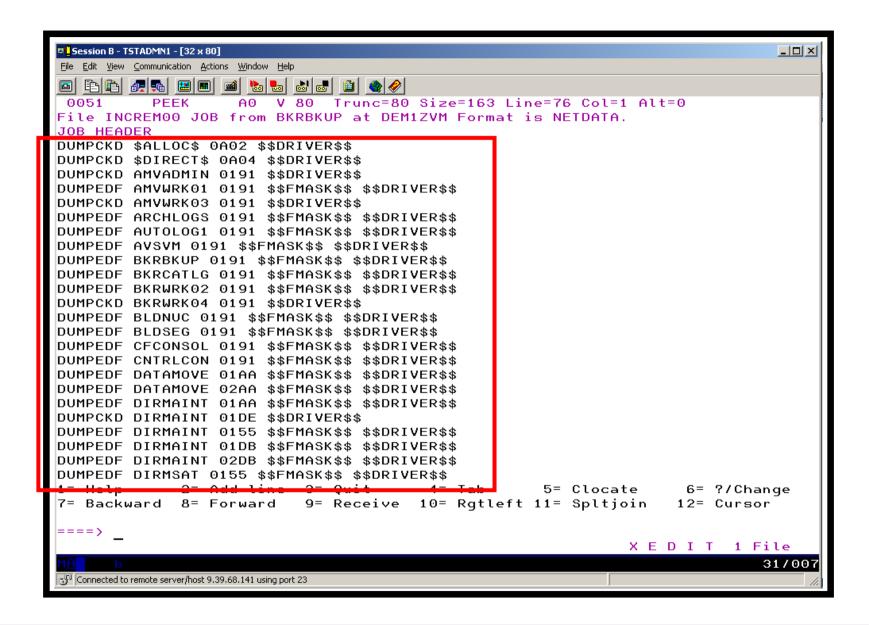


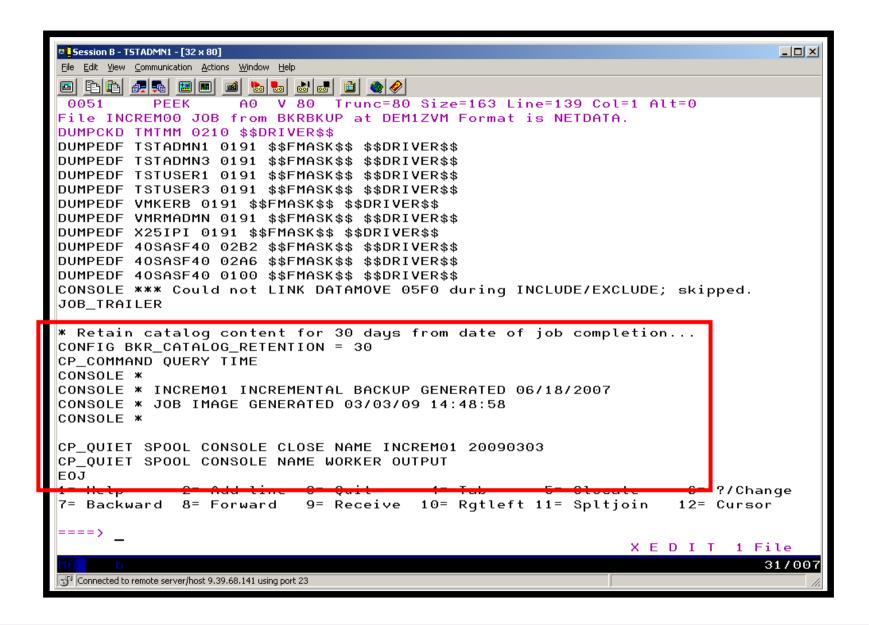


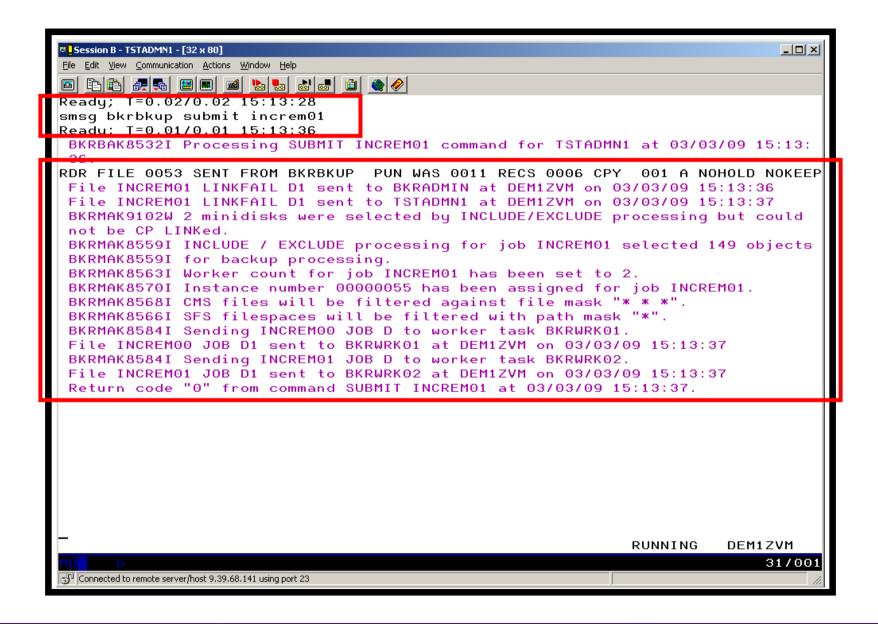


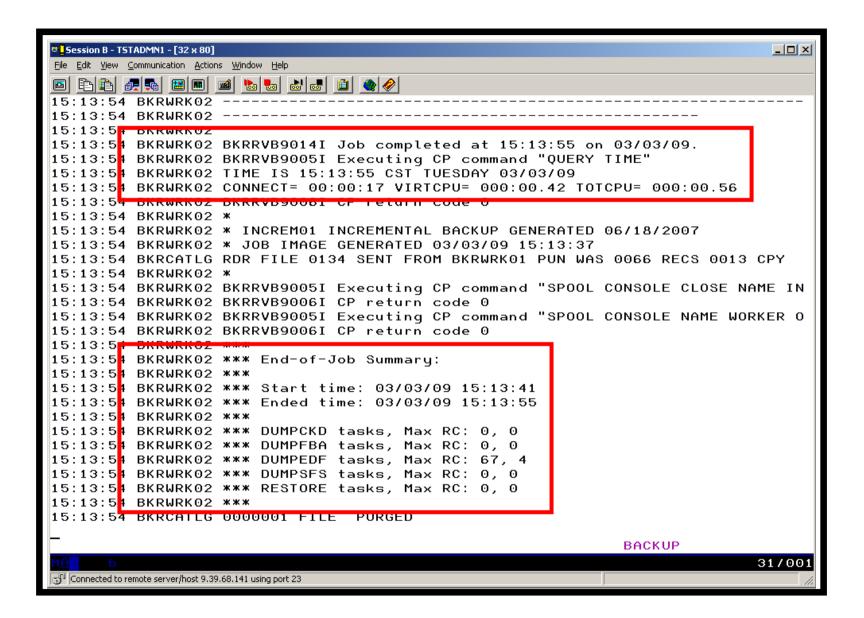












Scenario B: Restoring Files from Backup

- Full and incremental backups performed previously
- User accidentally erases or corrupts a file
- User restores the file from backup
 - Full screen interface to see all files available in backup
 - Including multiple "versions" of the same file
 - Filters and sorting available to easily find the needed file
 - Request restore directly to disk or to reader
- No administrator intervention required

Scenario B: Detailed Steps

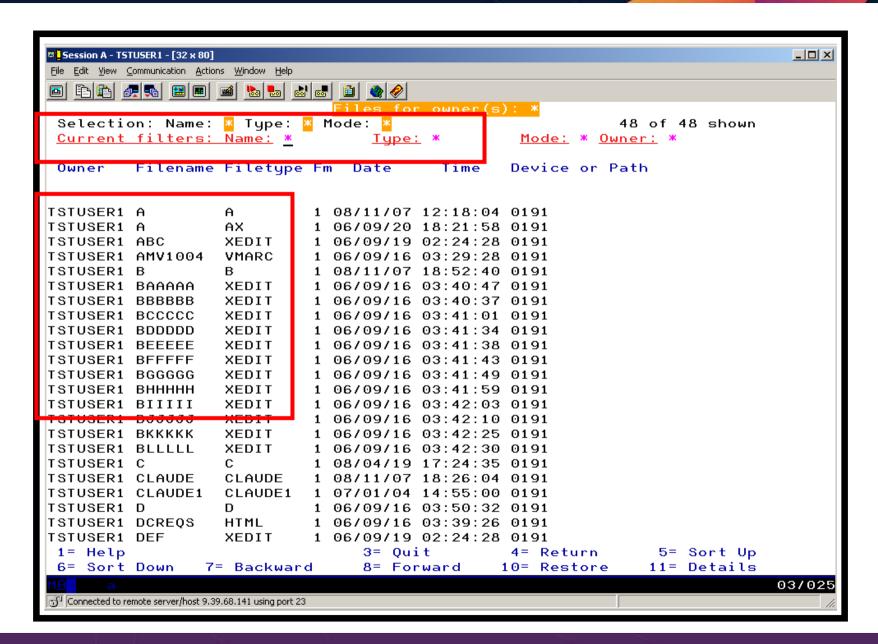
From a z/VM user ID, view all catalog data you own

bkrlist

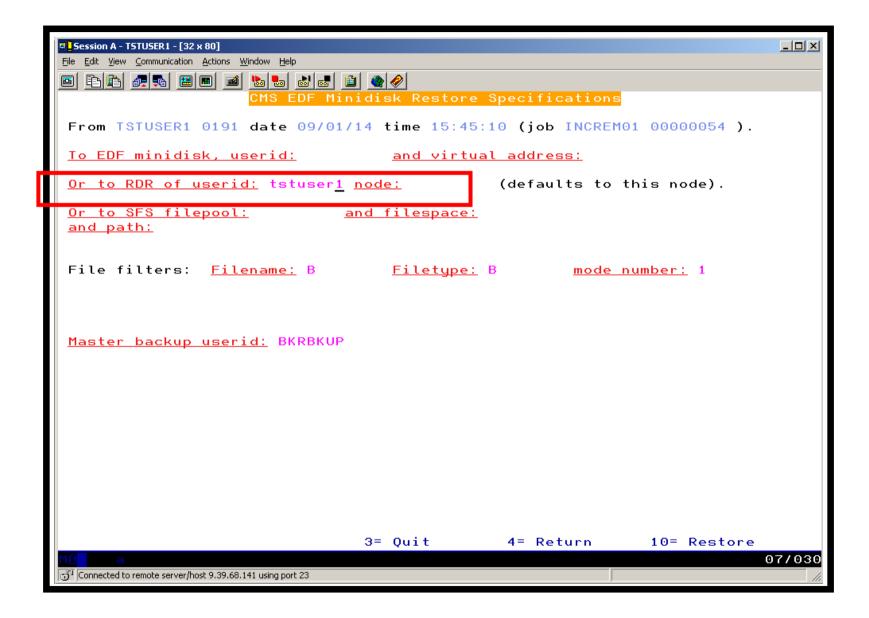
- Use the filters to find the file you want to restore
- Put the cursor on the file and hit F10
- Specify the user ID to whom the file should be sent and hit F10
- Look at the reader of that user ID to see the restored file and a copy of the console during the restore processing

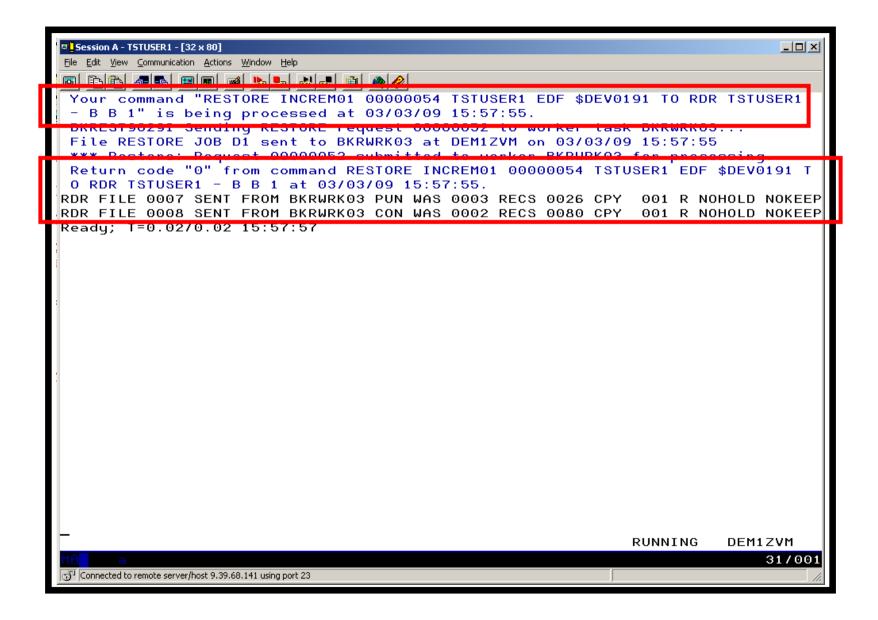
rdrlist

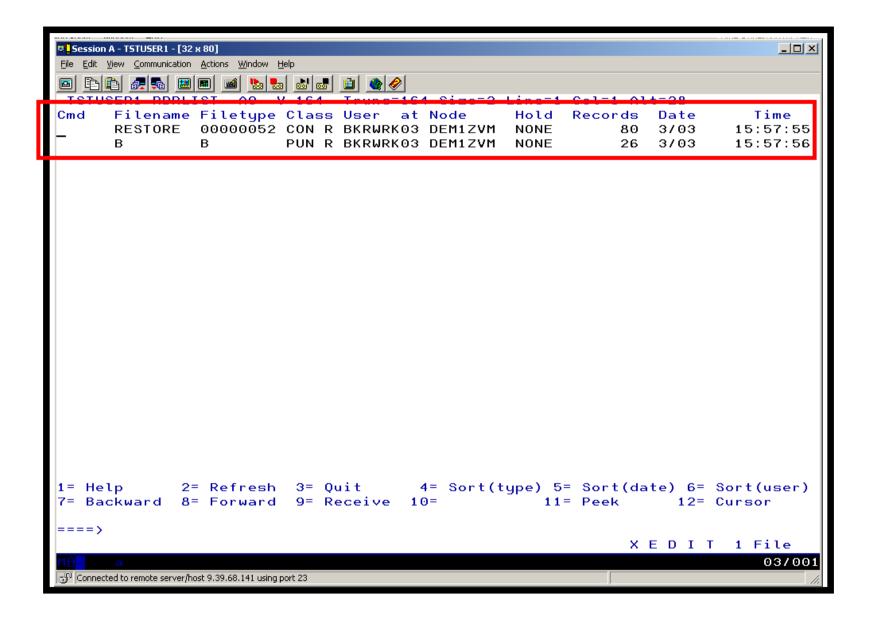
View the contents of the file to verify it's the correct version



```
Session A - TSTUSER1 - [32 x 80]
                                                                                  File Edit View Communication Actions Window Help
                     mer(s): *
 Selection: Name: 🔀 Type: 🔀 Mode: 🔀
                                                               18 of 48 shown
 Current filters: Name: B*
                                                    Mode: * Owner: *
                                   Tupe:
 Owner
         Filename Filetype Fm Date
                                           Time
                                                   Device or Path
                             1 09/03/03 14:47:52 0191
TSTUSER1 B
                   В
                             1 09702/18 10:40:42 0191
TSTUSER1 BJJJJJ
                   XEDIT
TSTUSER1 B
                             1 09/01/14 15:45:10 0191
TSTUSER1 B
                             1 08/12/30 11:08:27 0191
                   В
                             1 08/12/09 10:30:25 0191
TSTUSER1 B
TSTUSER1 B
                             1 08/11/07 18:52:40 0191
TSTUSER1 BLLLLL
                   XEDIT
                             1 06/09/16 03:42:30 0191
TSTUSER1 BKKKKK
                             1 06/09/16 03:42:25 0191
                   XEDIT
TSTUSER1 BJJJJJ
                   XEDIT
                             1 06/09/16 03:42:10 0191
TSTUSER1 BIIIII
                   XEDIT
                             1 06/09/16 03:42:03 0191
TSTUSER1 BHHHHH
                   XEDIT
                             1 06/09/16 03:41:59 0191
TSTUSER1 BGGGGG
                   XEDIT
                             1 06/09/16 03:41:49 0191
TSTUSER1 BFFFFF
                   XEDIT
                             1 06/09/16 03:41:43 0191
TSTUSER1 BEEEEE
                   XEDIT
                             1 06/09/16 03:41:38 0191
TSTUSER1 BDDDDD
                   XEDIT
                             1 06/09/16 03:41:34 0191
TSTUSER1 BCCCCC
                   XEDIT
                             1 06/09/16 03:41:01 0191
TSTUSER1 BAAAAA
                   XEDIT
                             1 06/09/16 03:40:47 0191
TSTUSER1 BBBBBB
                   XEDIT
                             1 06/09/16 03:40:37 0191
 1= Help
                                  3= Ouit
                                                   4= Return
                                                                   5= Sort Up
 6= Sort Down
                 7= Backward
                                  8= Forward
                                                 10= Restore
                                                                  11= Details
                                                                                08/032
Connected to remote server/host 9.39.68.141 using port 23
```







```
Session A - TSTUSER1 - [32 x 80]
                                                                              File Edit View Communication Actions Window Help
A0 V 80 Trunc=80 Size=41 Line=24 Col=1 Alt=0
0007
          PEEK
File B B from *BACKUP* at DEM1ZVM Format is NETDATA.
Change made at 11:37am central time Sept 17, 2007
Change made at 12:31am eastern time Sept 25, 2007
Change made at 2:06pm mountain standard time Oct 9, 2007
Change made at 11:14am pacific time March 3, 2008
Change made at 9:20am central time March 4, 2008
Change made at 15:53pm eastern time April 19, 2008
Change made at 14:44
                       cet
                                     May 5, 2008
Change made at 08:45
                                     July 3, 2008
Change made at 08:56am pt
                                     July 11, 2008
Change made at 11:04am pt
                                     July 15, 2008
                                   August 4, 2008
Change made at 10:16am pt
Change made at 08:10am pt
                                   Sept 11, 2008
Change made at 09:12am pt
                                   Sept 18, 2008
Change made at 2:00pm pt
                                   Oct 23, 2008
Change made at 16:27pm Brasil
                                   Nov 11, 2008
<del>Mange made at 11:01am et</del>
Change made at 11:09am ct
                                   Dec 30, 2008
Change made at 15:45 ct
                                   Jan 14, 2009
* * * End of File * * *
             2= Add line 3= Ouit
1= Help
                                        4= Tab
                                                    5= Clocate
                                                                    6= ?/Change
7= Backward 8= Forward
                          9= Receive 10= Rgtleft 11= Spltjoin
                                                                   12= Cursor
====>
                                                              X E D I T 1 File
                                                                            31/007
Connected to remote server/host 9,39,68,141 using port 23
```

Scenario C: Back up and Restore Single and Multiconfiguration Users in SSI

- Two member SSI cluster
 - TEST7SSI, TESTCSSI
- Three backup jobs for full backups
 - USERFULL all single configuration users across the SSI cluster
 - Always run from TEST7SSI (required (for now))
 - IDSSI7FL all multiconfiguration (IDENTITY) users on TEST7SSI
 - Always run from TEST7SSI (required)
 - IDSSICFL all multiconfiguration (IDENTITY) users on TESTCSSI
 - Always run from TESTCSSI (required)
- Three similar jobs for incremental
- Restore files in multiple ways
 - Single configuration users
 - Restore to disk or reader from any member of the cluster
 - Multiconfiguration users
 - Restore to disk from the local member
 - Restore CMS files to reader from any member

Scenario C: Detailed Steps

 From a Backup Manager admin ID (DEMOADMN) on TEST7SSI, view all catalog data for multiconfiguration user OP1

bkruser

- Use the filters to find all files for OP1's 191 disk
 - Note files exist from both TEST7SSI and TESTCSSI
- F4 to return and then find all files for single configuration user DEMOADMN
 - Note files only exist in the USERxxxx jobs not member specific
- Update a file on OP1 191 disk

```
link op1 191 333 mr
acc 333 z
x test op1 z
```

• Add a new line to the file

```
file
rel z (det
```

Similarly update a file on DEMOADMN 191 disk

```
x test demoadmn a
```

• Perform a review of the incremental backup for multiconfiguration users on TEST7SSI smsg bkrbkup review idssi7in

Scenario C: Detailed Steps

- Perform a backup for multiconfiguration users on TEST7SSI
 smsg bkrbkup submit idssi7in
- View the console of the worker(s) assigned gomcmd opmgrml viewcon user(bkrwrkxx)
- Perform a backup for single configuration users in the TEST7SSI and TESTCSSI cluster

smsq bkrbkup submit userincr

 When jobs are complete find the updated test files for OP1 and DEMOADMN in the catalog

bkrlist

- Once a file is chosen, use F10 to restore the file to the reader
- View the files in the reader

rdrlist

Logoff DEMOADMN (do not disconnect – must logoff)

logoff

Scenario C: Detailed Steps

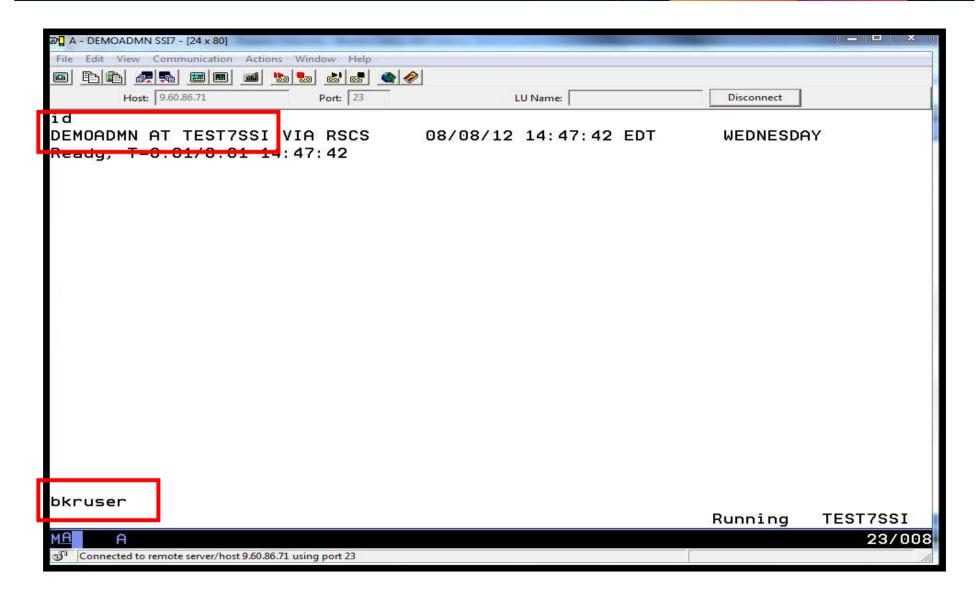
- Logon DEMOADMN on the other member of the cluster TESTCSSI
- Find the test files for DEMOADMN in the catalog

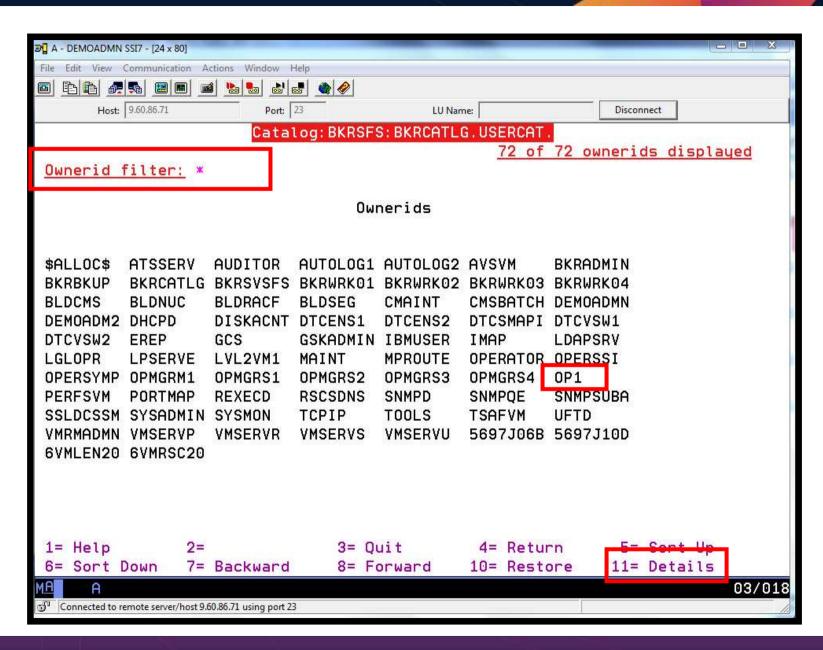
bkrlist

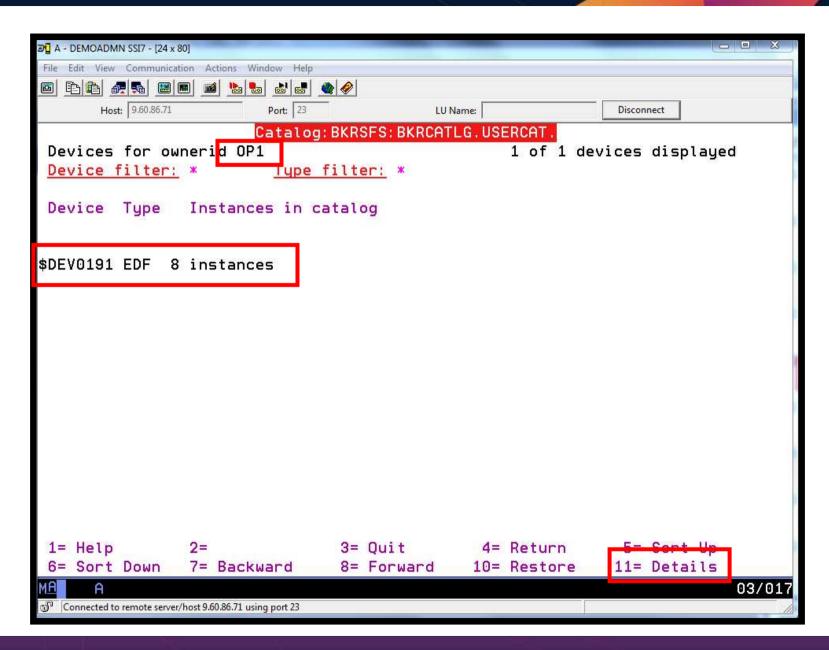
- Once a file is chosen, use F10 to restore the file to the reader
- View the files in the reader

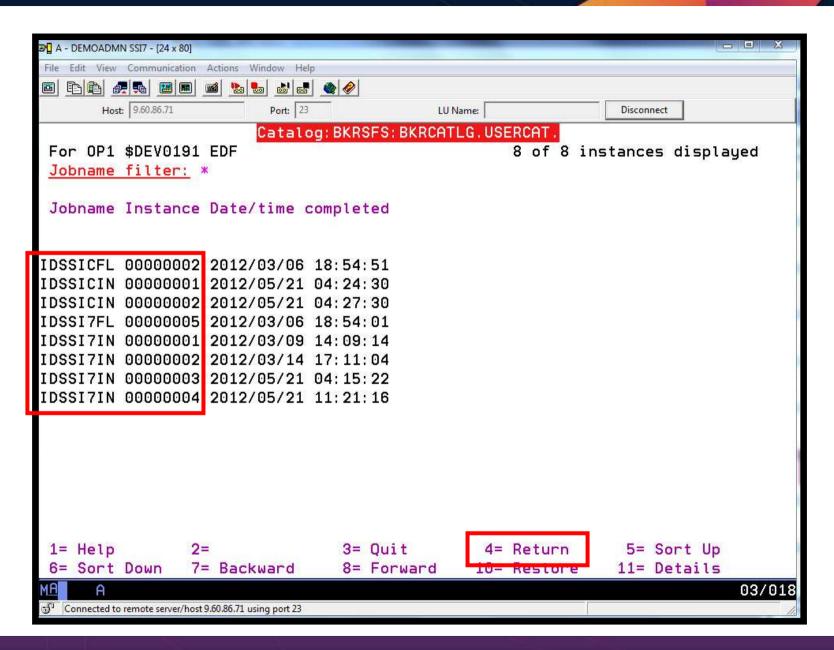
rdrlist

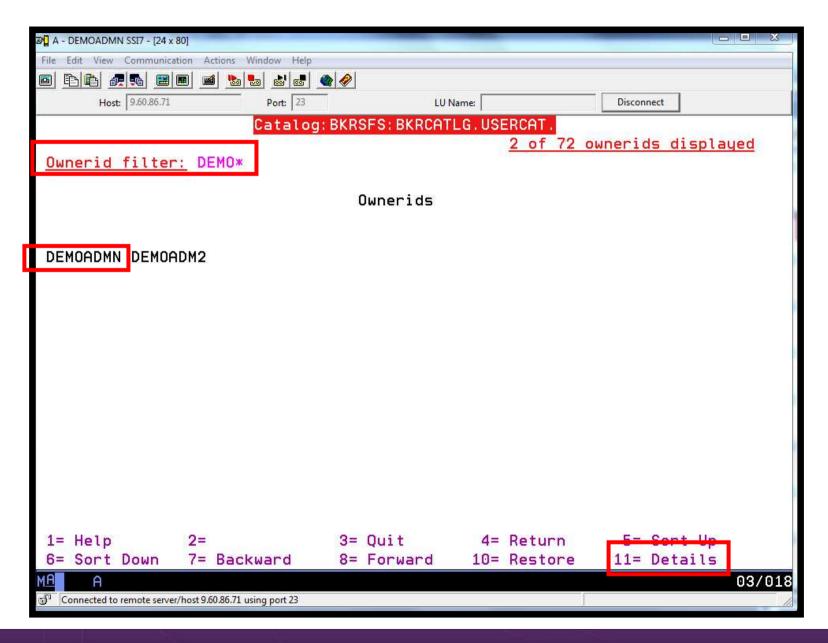
 Notice you can restore files for DEMOADMN from either member of the cluster

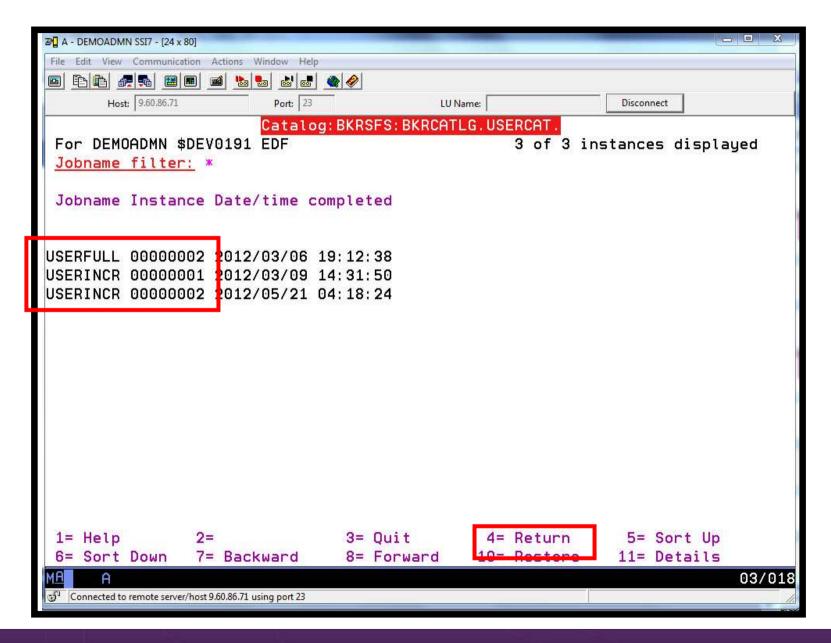


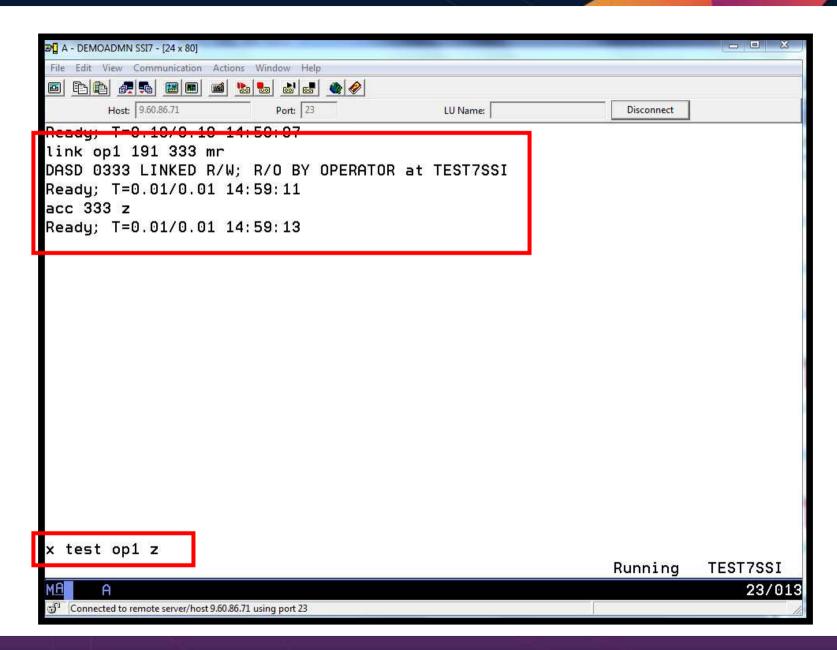


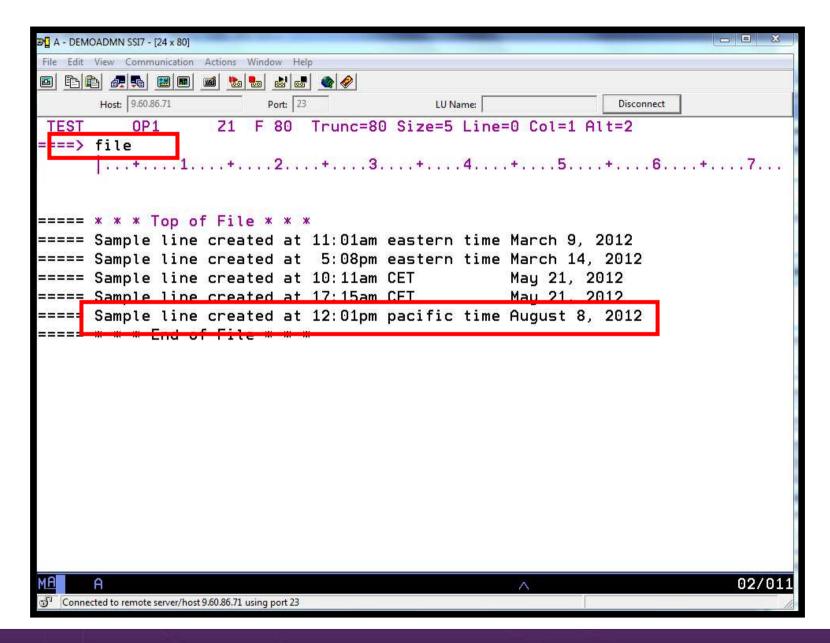


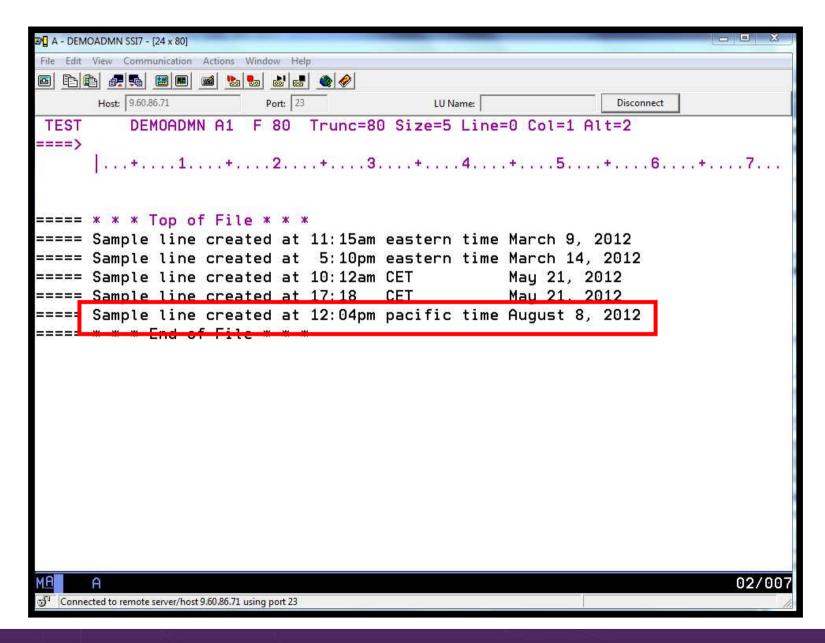


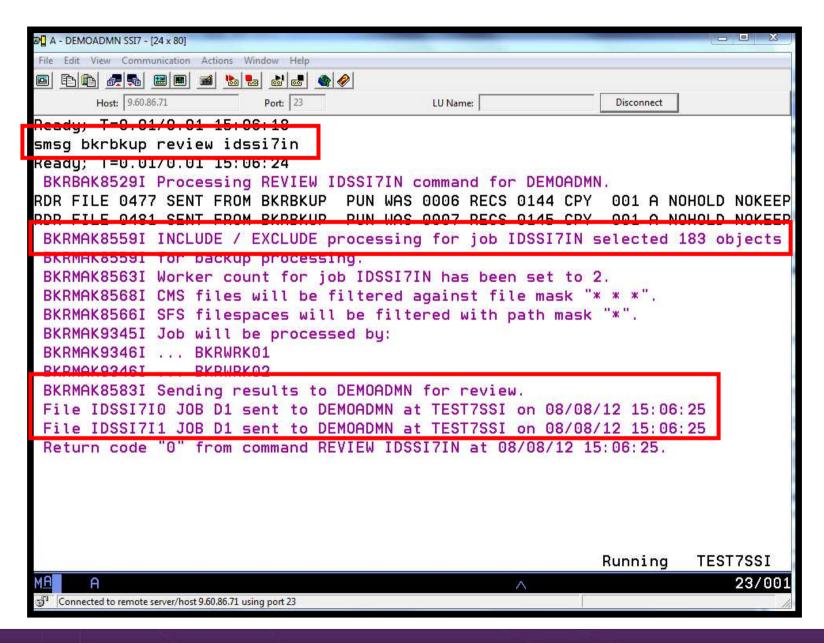


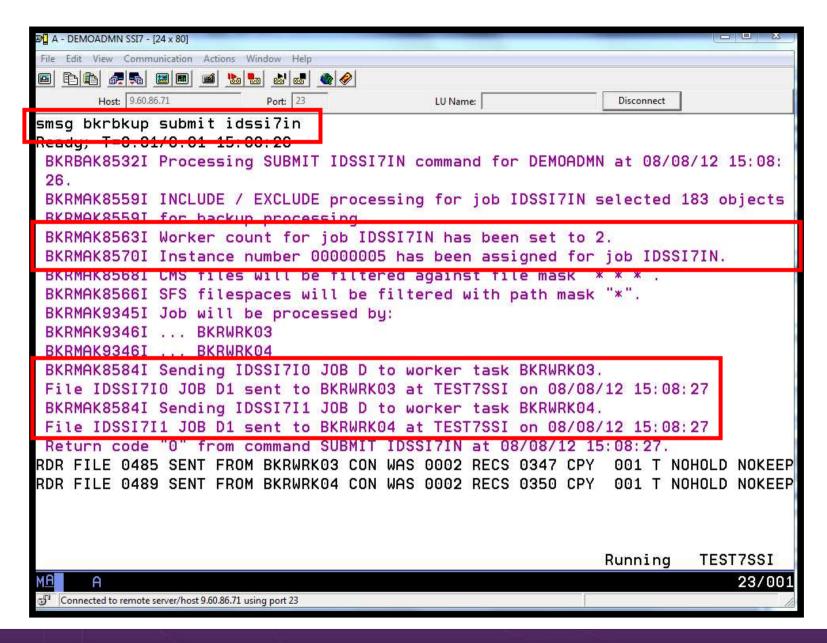


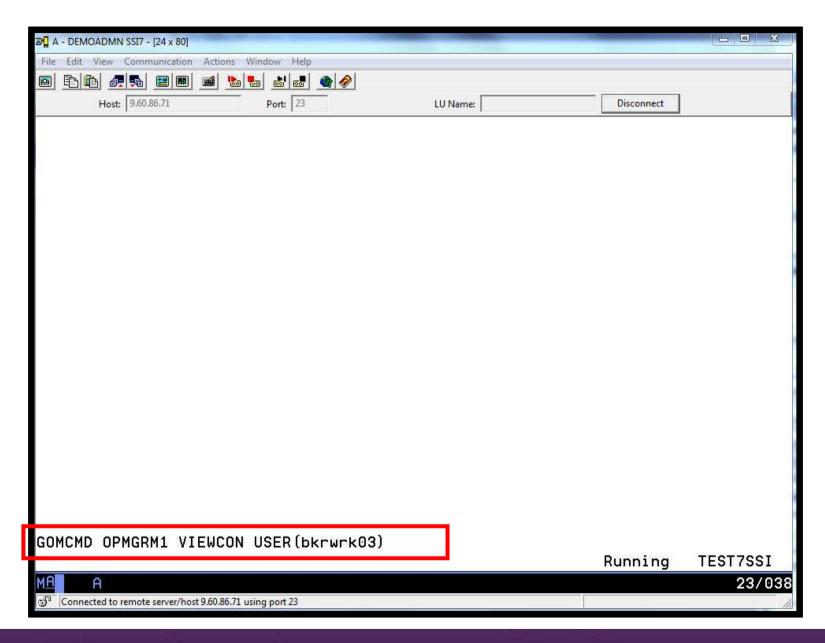


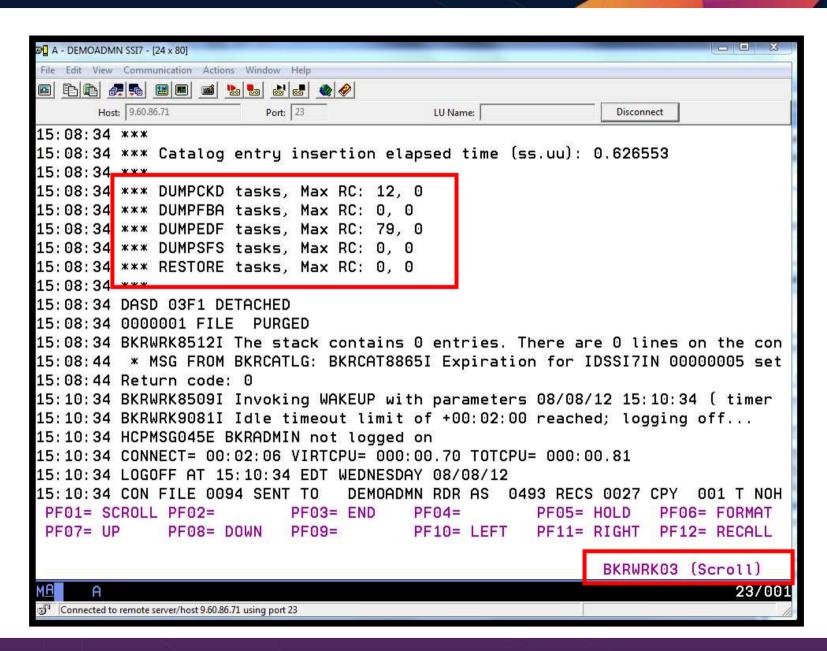


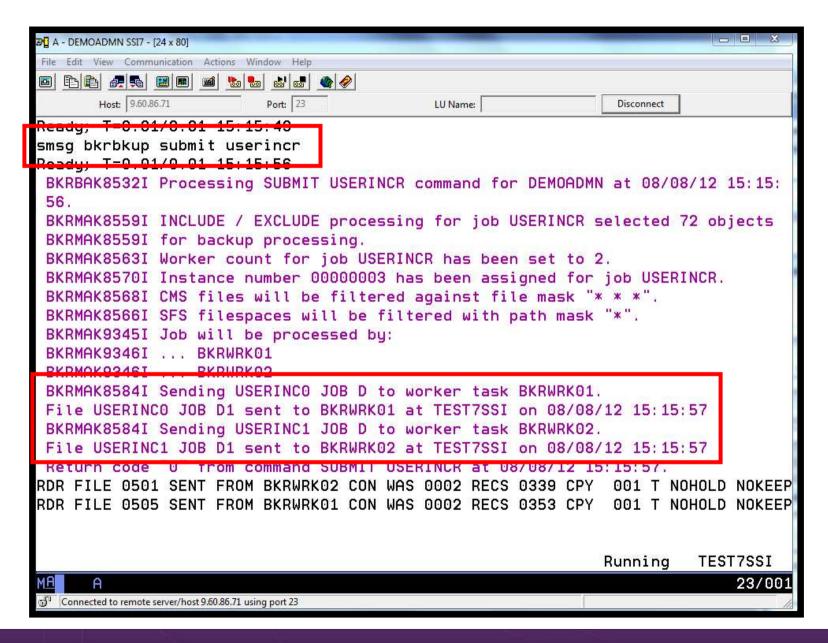


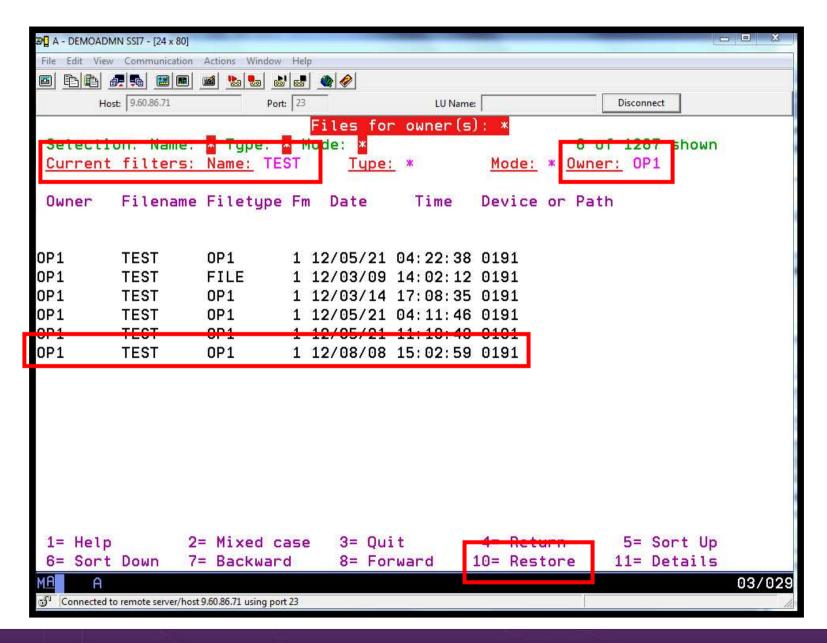


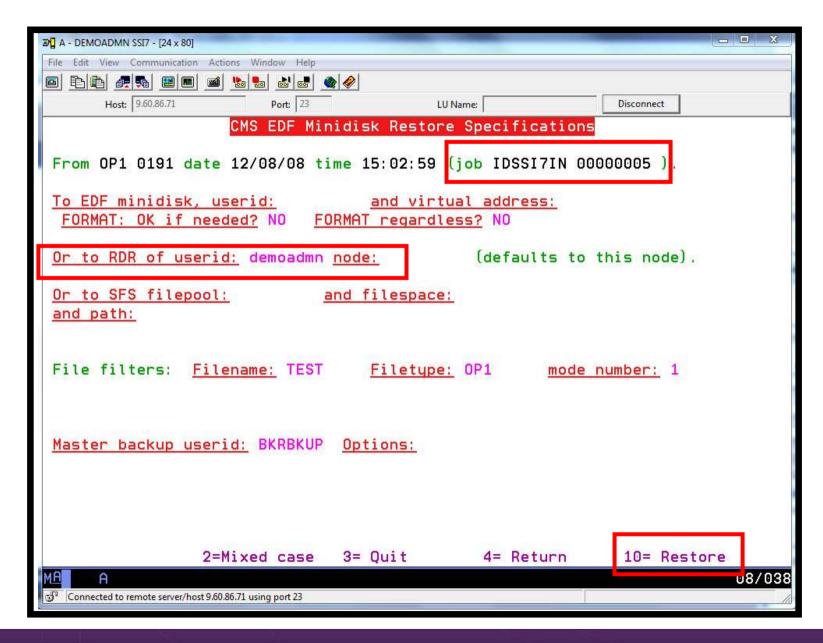


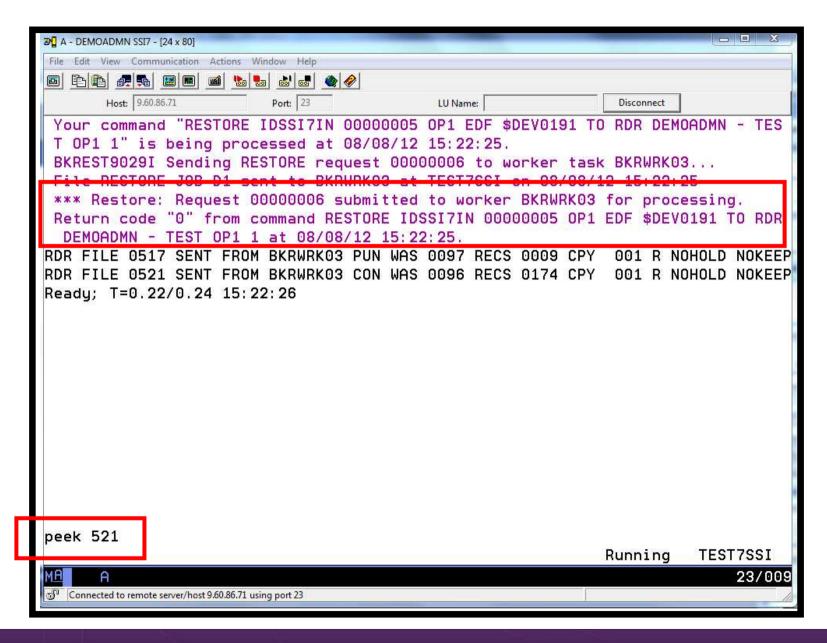


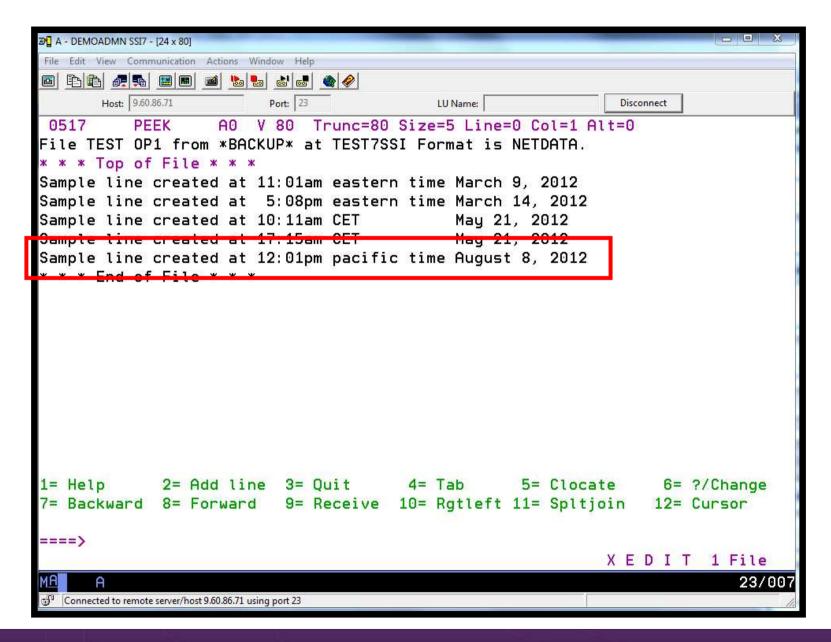


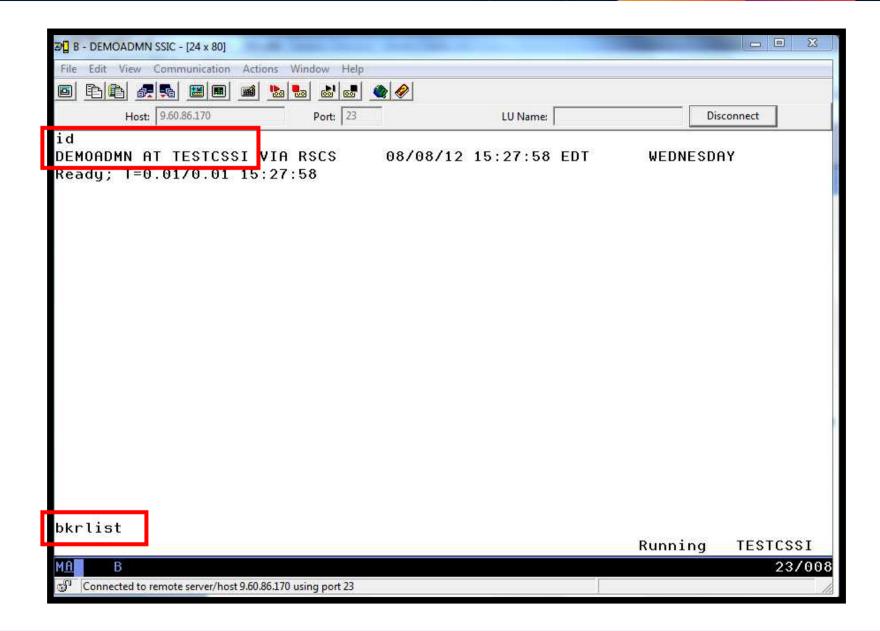


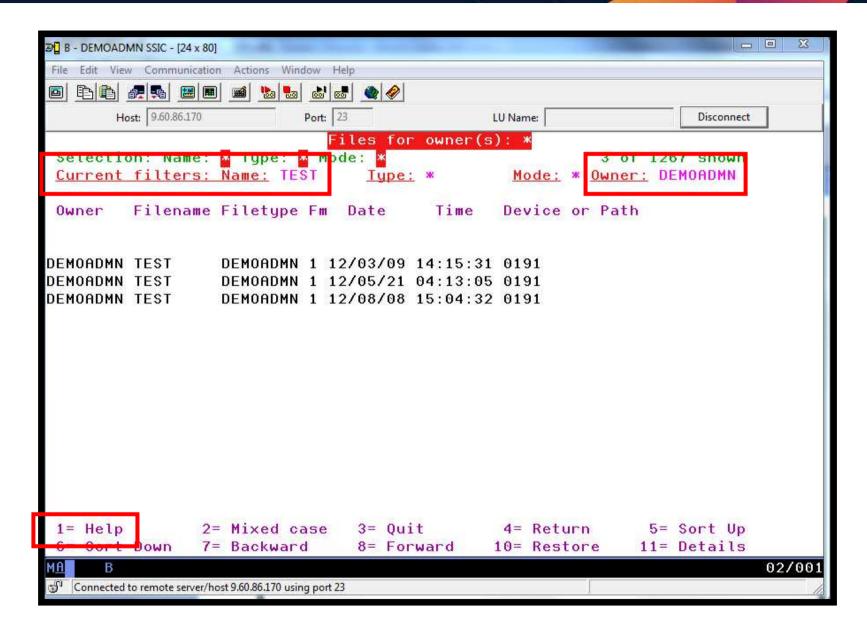












Scenario D: Scheduling Image Backups of Linux Guests

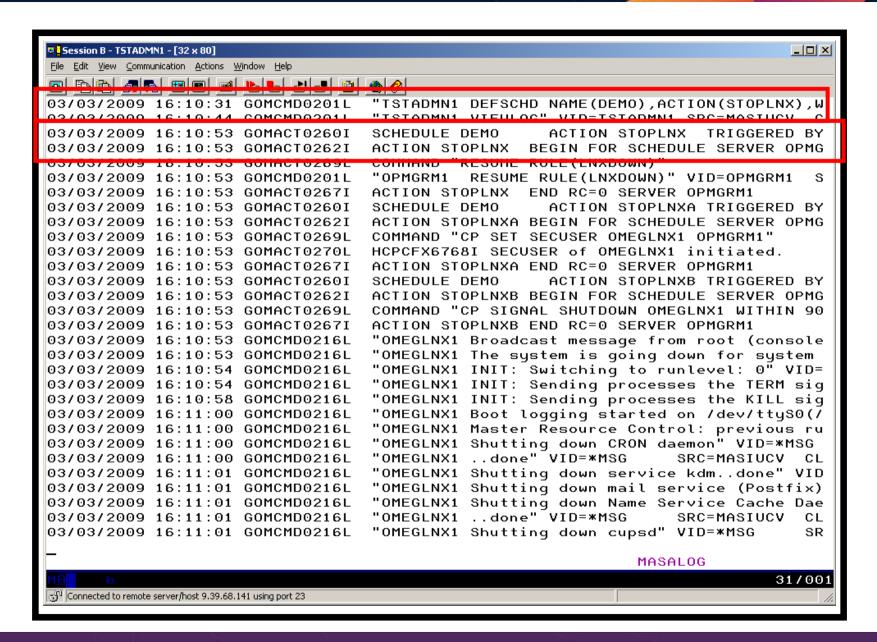
- Initiated or scheduled by Operations Manager
 - Schedule defined in Operations Manager to initiate backups at specific times/intervals
 - Action associated with each schedule
 - Linux guest is shut down
 - Operations Manager watches for shutdown complete
 - Sends request to Backup and Restore Manager to back up the specific DASD/minidisks associated with the guest
 - Alternatively use FLASHCOPY to copy DASD, restart guest, then perform backup of copy of DASD.
 - Operations Manager watches for backup complete message
 - Restarts Linux guest
 - Guest is down for minimum time required for backup

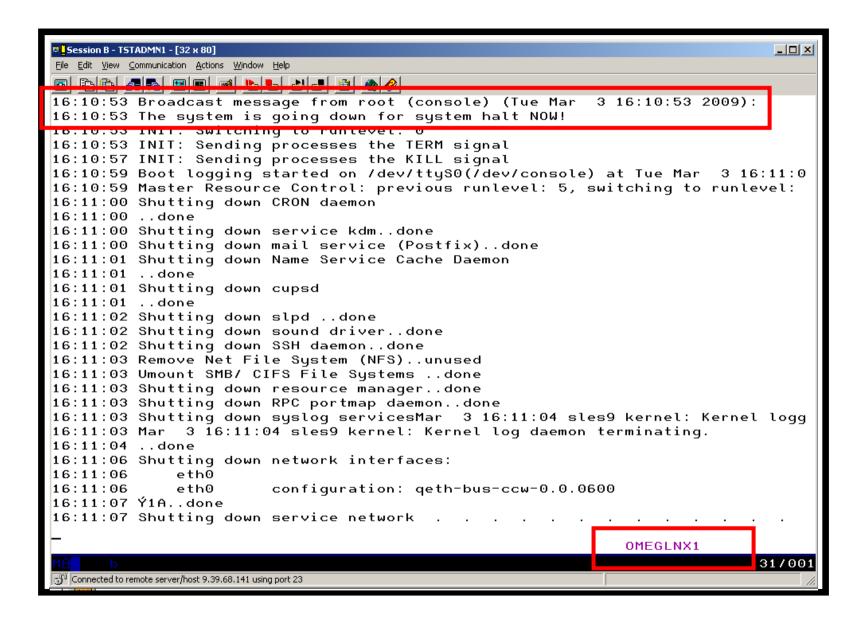
Scenario D: Detailed Steps

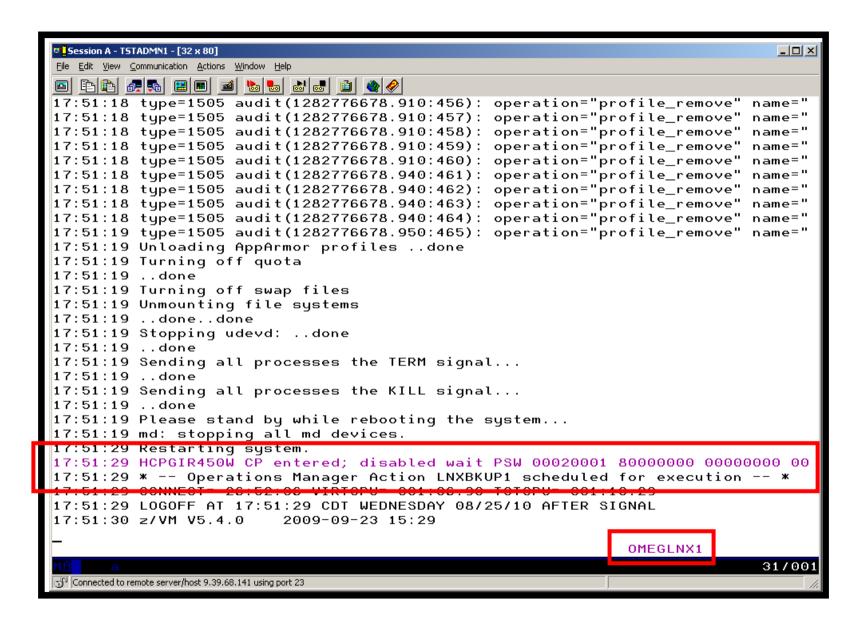
Define a schedule to start the automated backup process

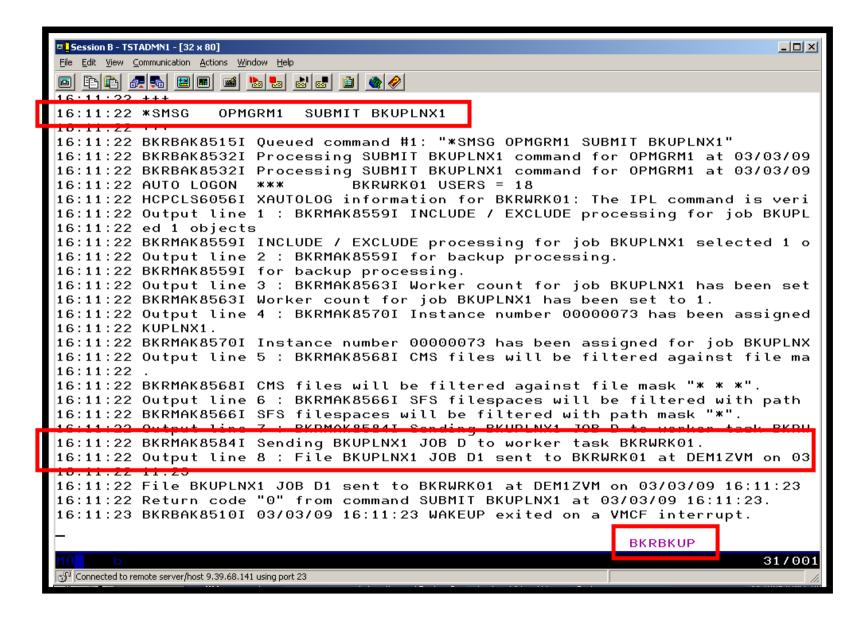
```
gomcmd opmgrm1 defschd name(demo),action(stoplnx),when(now)
```

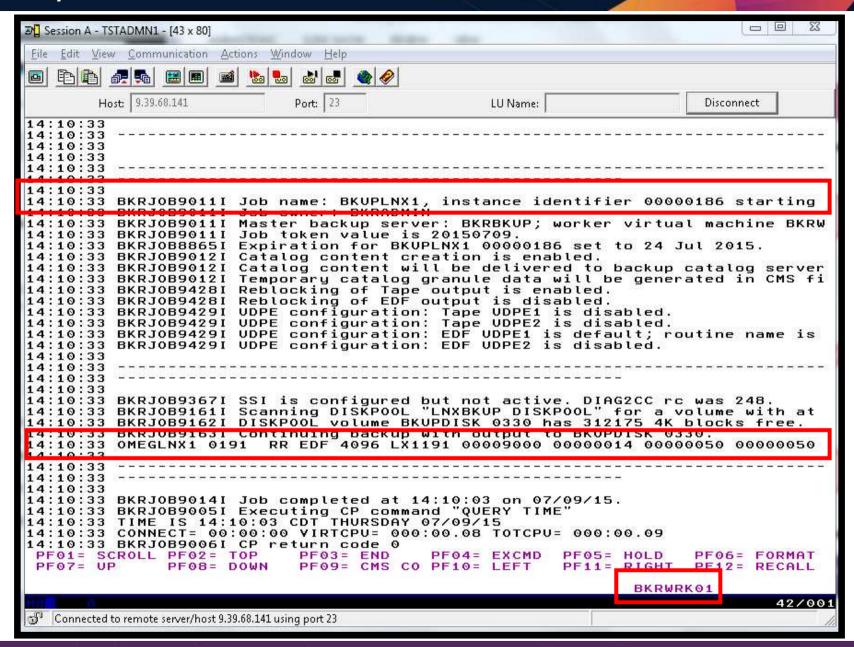
- View the Operations Manager log to see the schedule trigger gomcmd opmgrm1 viewlog
- View the console of the Linux guest to see it shut down gomcmd opmgrml viewcon user(omeglnx1)
- View the console of the backup server to see the backup start gomcmd opmgrm1 viewcon user(bkrbkup)
- Find the worker that has been assigned and view its console gomcmd opmgrm1 viewcon user(bkrwrkxx)
- View the console of the Linux guest to see it restart gomcmd opmgrm1 viewcon user(omeglnx1)
- View the backup catalog to see the completed job
 bkrjob

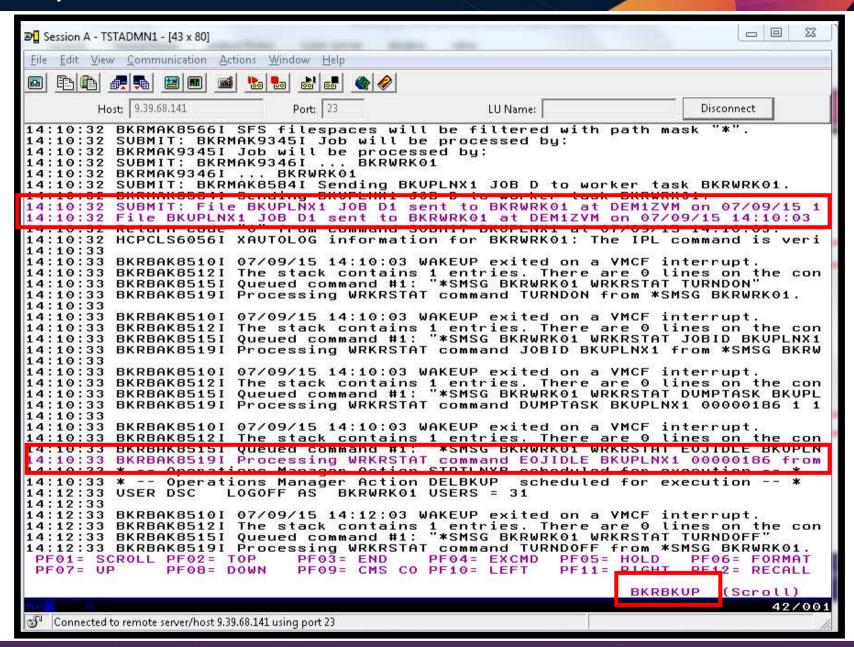


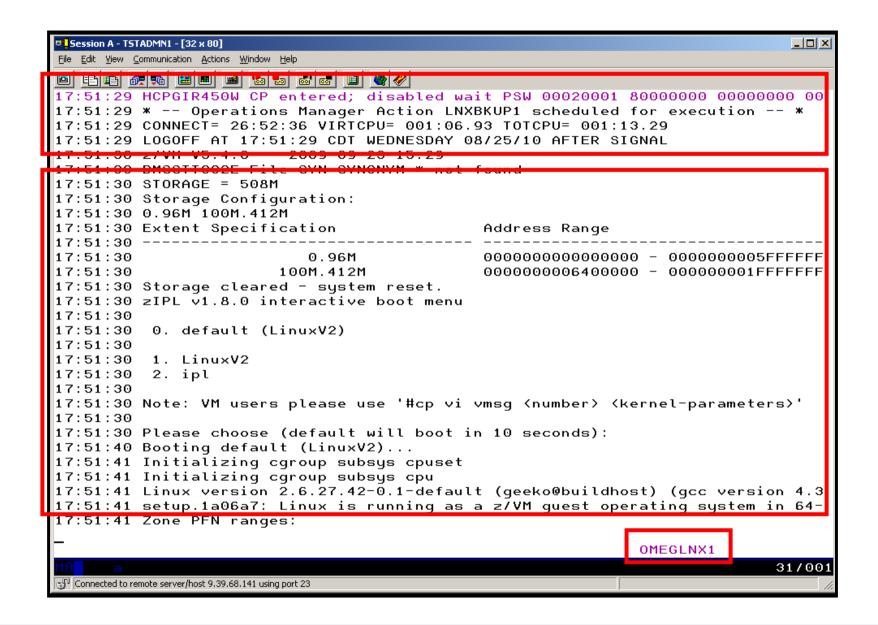


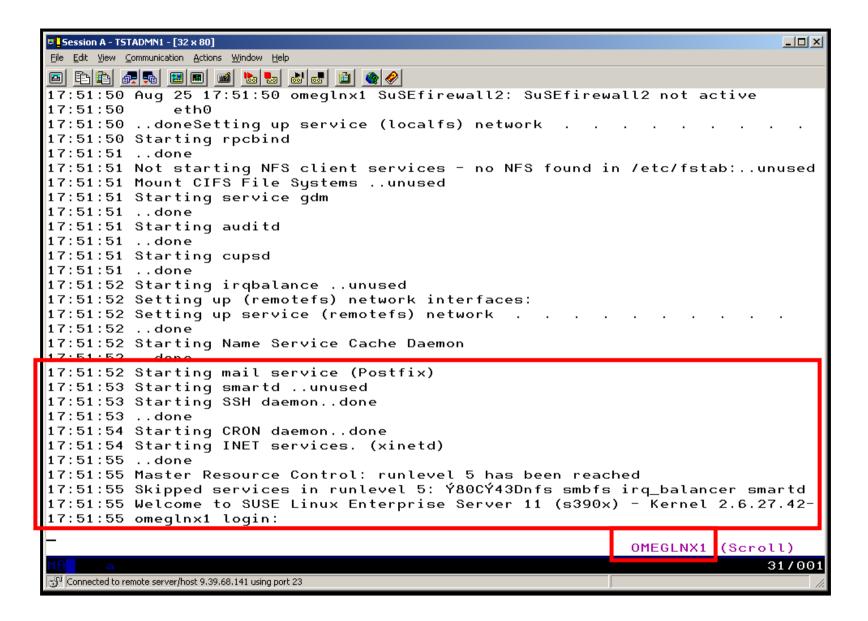












Console rule in Operations Manager:

```
*
* Watch for shutdown complete message on Linux guest
DEFRULE NAME(LNXDOWN),+
    MATCH(*HCPGIR450%*),+
    USER(OMEGLNX1),+
    ACTION(LNXBKUP)
* Turn off the rule in general
SUSPEND RULE(LNXDOWN)
```

Chain of actions in Operations Manager, triggered by schedule

```
* Start of quest backup scenario, resume rule for quest shutdown msq
DEFACTN NAME (STOPLNX),+
  COMMAND('RESUME RULE(LNXDOWN)'),+
  ENV(GOM),+
 NEXTACTN (STOPLNXA)
* Change SECUSER to Operations Manager before shutting it down
DEFACTN NAME (STOPLNXA),+
  COMMAND(CP SET SECUSER OMEGLNX1 OPMGRM1),+
 ENV(LVM),+
 NEXTACTN (STOPLNXB)
* Action to shut down Linux guest in prep for backup
DEFACTN NAME (STOPLNXB),+
  COMMAND(CP SIGNAL SHUTDOWN OMEGLNX1 WITHIN 90),+
  ENV(LVM)
```

Chain of actions and rules in Operations Manager:

```
* Highlight message and submit backup job for a specific Linux quest
DEFACTN NAME (LNXBKUP),+
  INPUT(AHI),+
  NEXTACTN (LNXBKUPB)
DEFACTN NAME (LNXBKUPB),+
  COMMAND(CP SMSG BKRBKUP SUBMIT BKUPLNX1),+
  ENV(LVM)
* Restart Linux quest when Backup is complete
DEFRULE NAME (BKUPDONE),+
  MATCH(*BKRBAK8519I Processing WRKRSTAT command EOJIDLE BKUPLNX1*),+
  USER(BKRBKUP),+
  ACTION (STRTLNX)
```

Suspend rule in Operations Manager (don't back up the guest every time it is shut down)

```
* Suspend rule for backing up Linux guest
DEFACTN NAME(DELBKUP),+
COMMAND(SUSPEND RULE(LNXDOWN)),+
ENV(GOM)
```

Scenario E: Suspend and Resume a Linux Guest

• From DEMOADMN, view the console of the Linux guest

gomcmd opmgrm1 viewcon user(rhel6d)

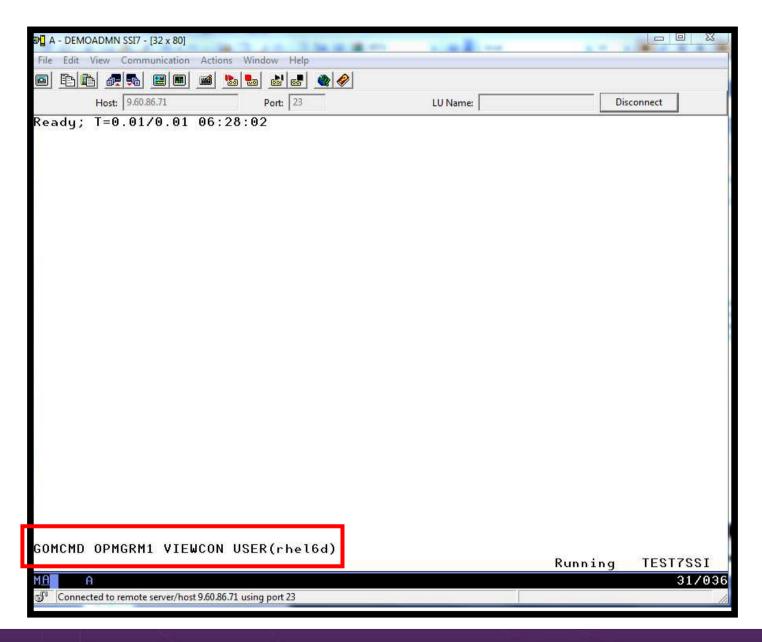
 From MAINT, suspend a Linux guest using CP SIGNAL SHUTDOWN

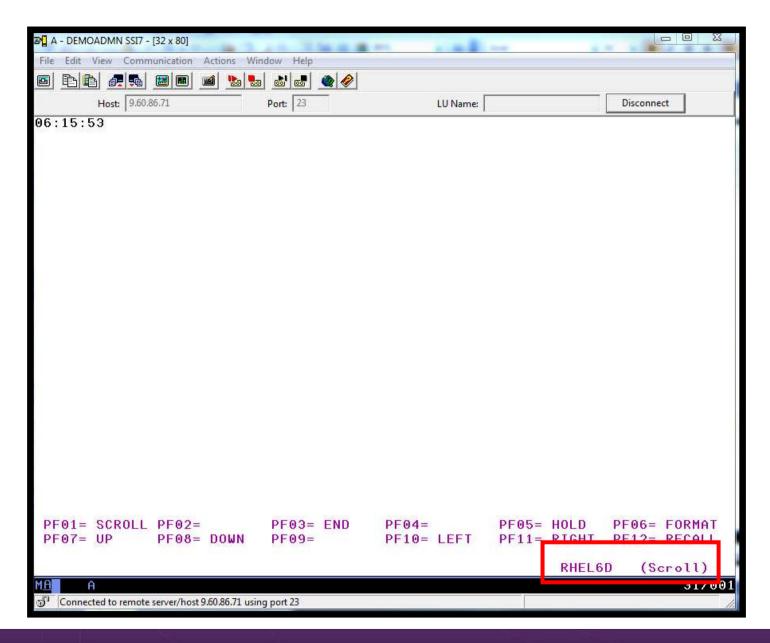
cp signal shutdown rhel6d within 90

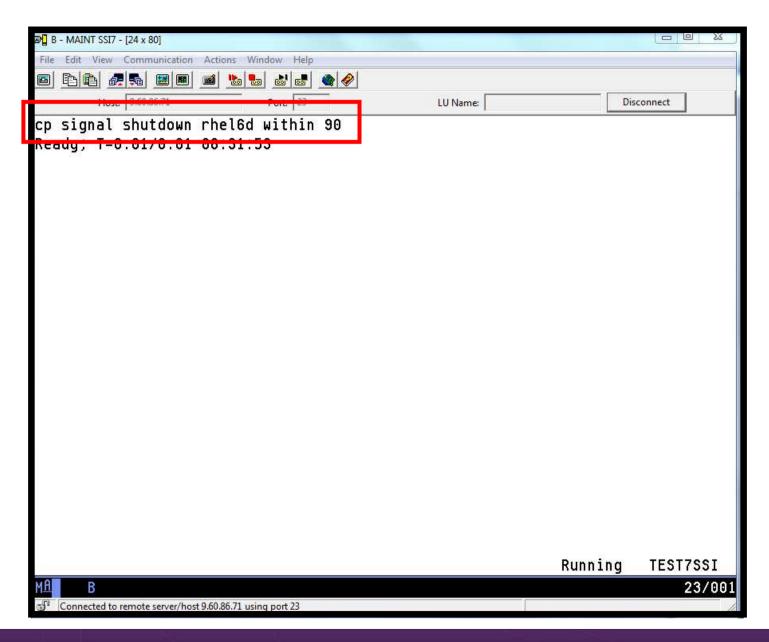
- On DEMOADMN, note the guest suspending and logging off
- From MAINT, resume a Linux guest

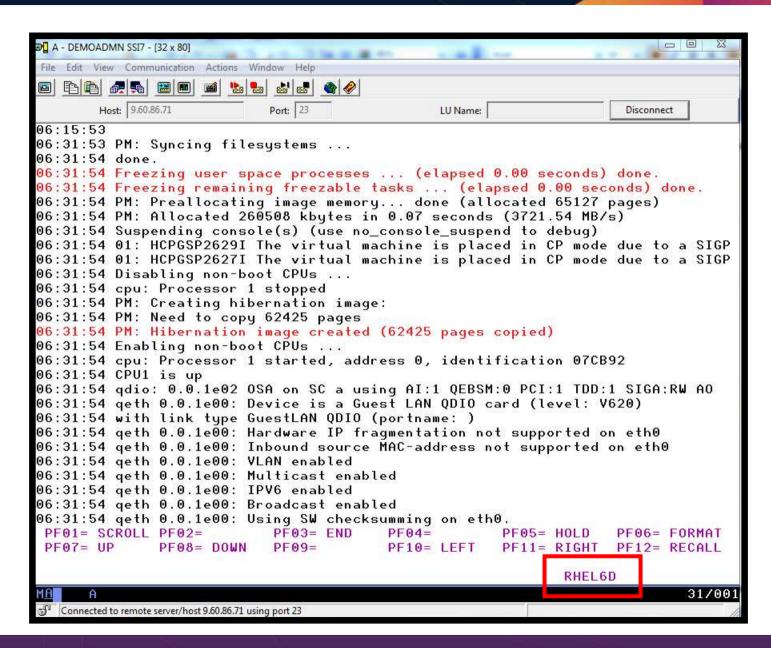
cp xautolog rhel6d

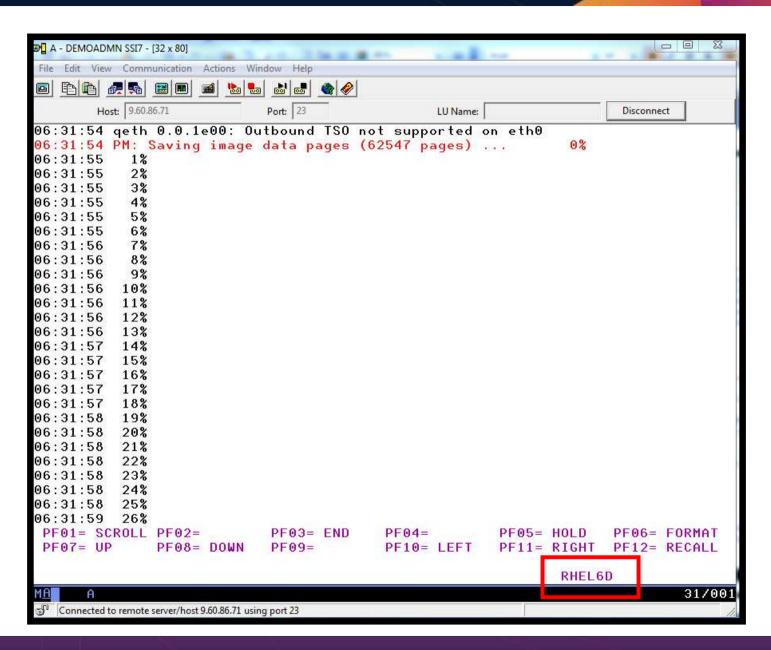
On DEMOADMN, note the guest resuming

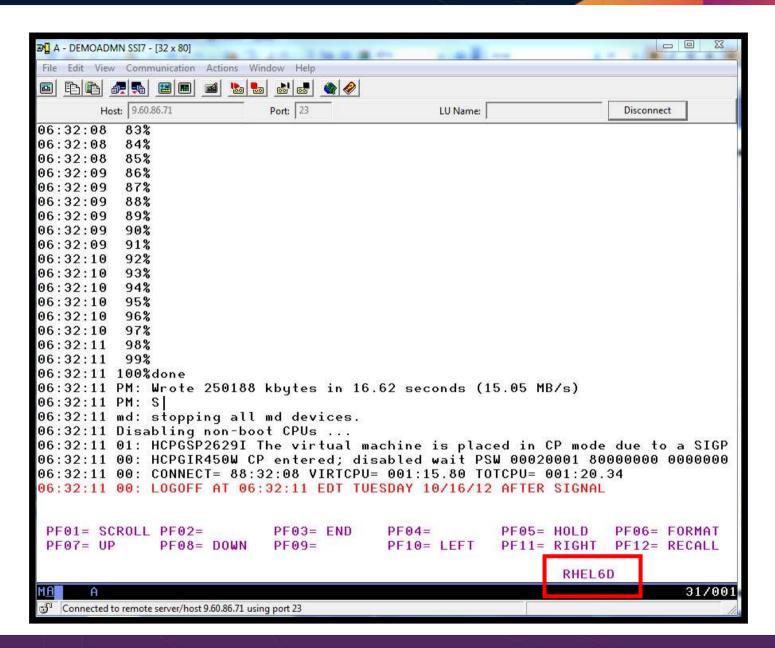


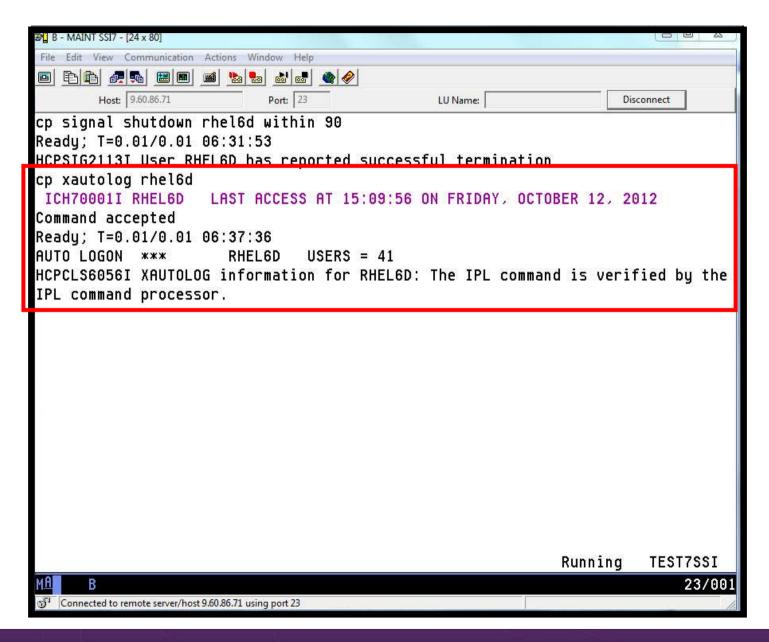


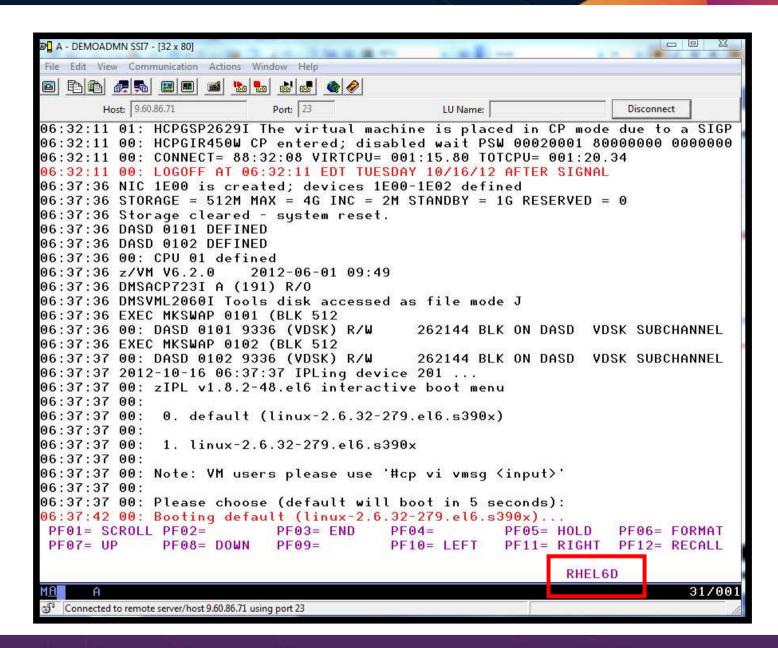


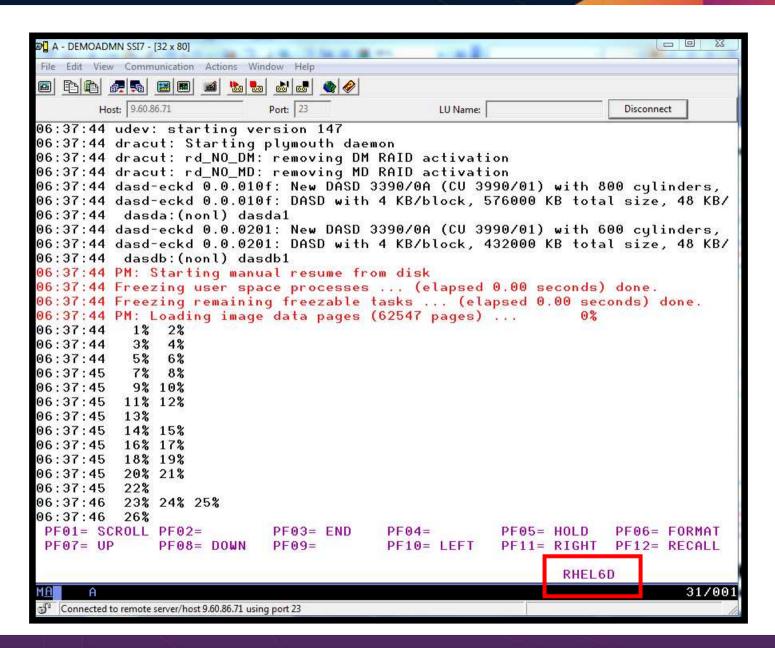


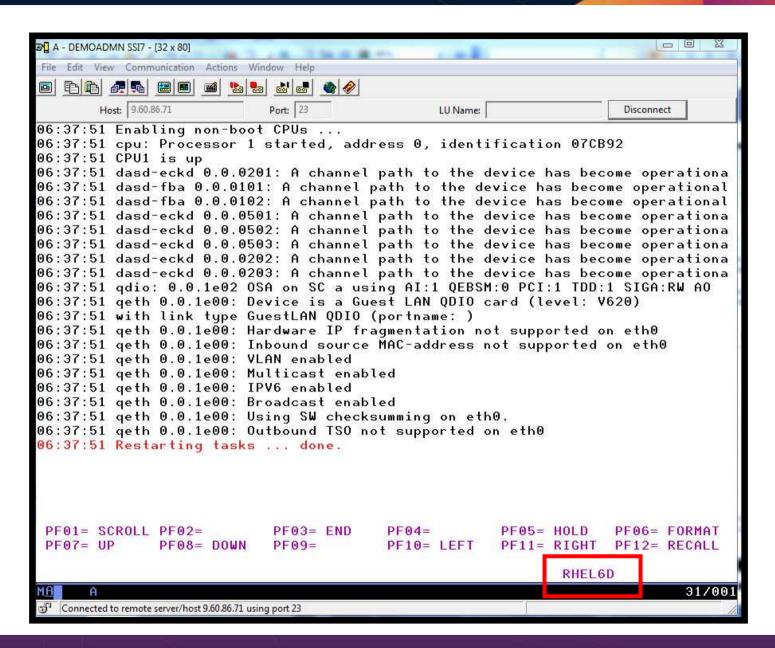












Define swap space in /etc/fstab

```
/dev/disk/by-path/ccw-0.0.010f-part1 swap
```

Enable suspend/resume and define swap space to use for it in zipl.conf

```
resume=/dev/disk/by-path/ccw-0.0.010f-part1
```

Define suspend as response to signal shutdown (via controlalt-delete.conf)

```
script
/bin/echo disk > /sys/power/state || /sbin/shutdown -h -t 4 now
end script
```

Scenario F: Reviewing a Disaster Recovery Backup

- Create a backup job based on sample provided
- Perform image backup of DASD volumes for Disaster Recovery (DR) purposes
 - Can include z/VM and Linux guests
- Output of backup is a DDR tape
 - Compatible with DDR for restore at recovery site
- Submit DR job for review
- Review output of review processing

Scenario F: Detailed Steps

- From an authorized z/VM user ID, copy the sample DDR template from the sample disk to a new backup job
- Edit the new job and make necessary changes

```
xedit ddrdemo template c
```

 If not using SFS for templates disk, tell Backup Manager to reaccess the disk

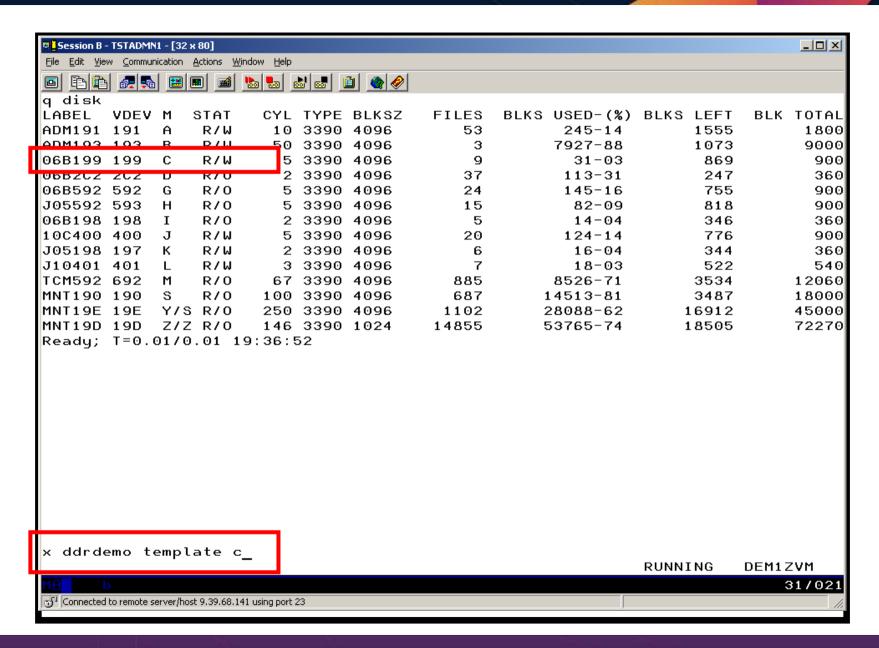
```
smsq bkrbkup cms acc 199 e/e
```

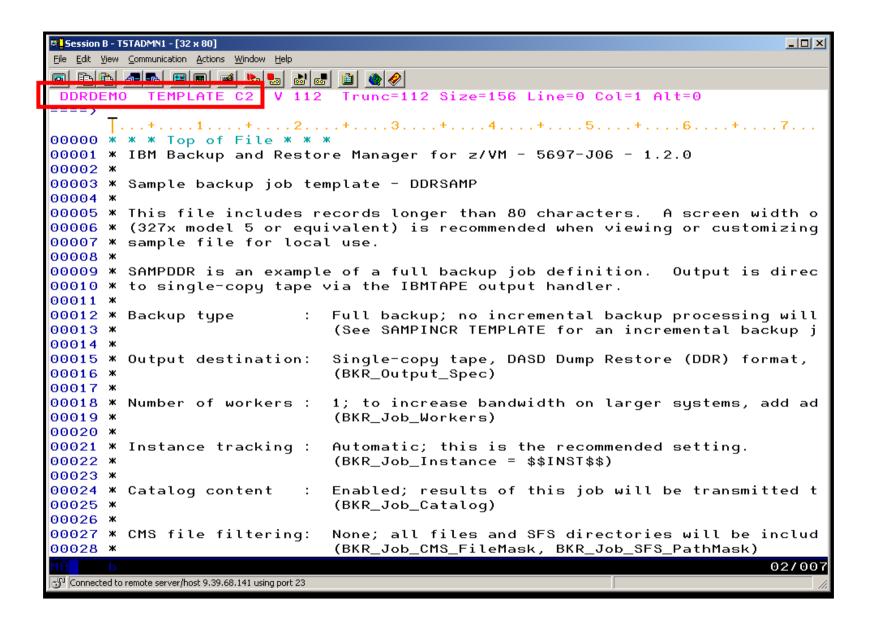
 From an authorized z/VM user ID, submit the backup job for review processing

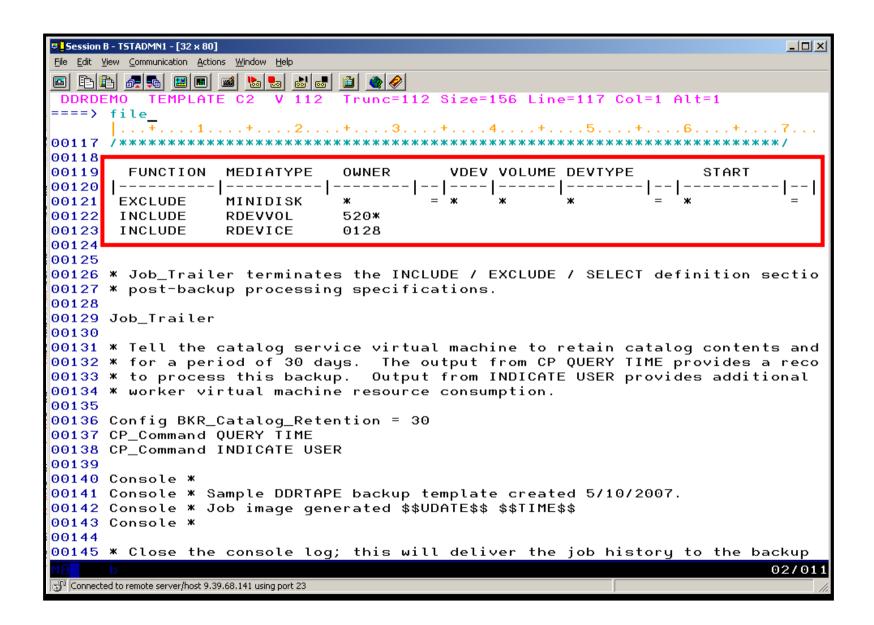
```
smsg bkrbkup review ddrdemo
```

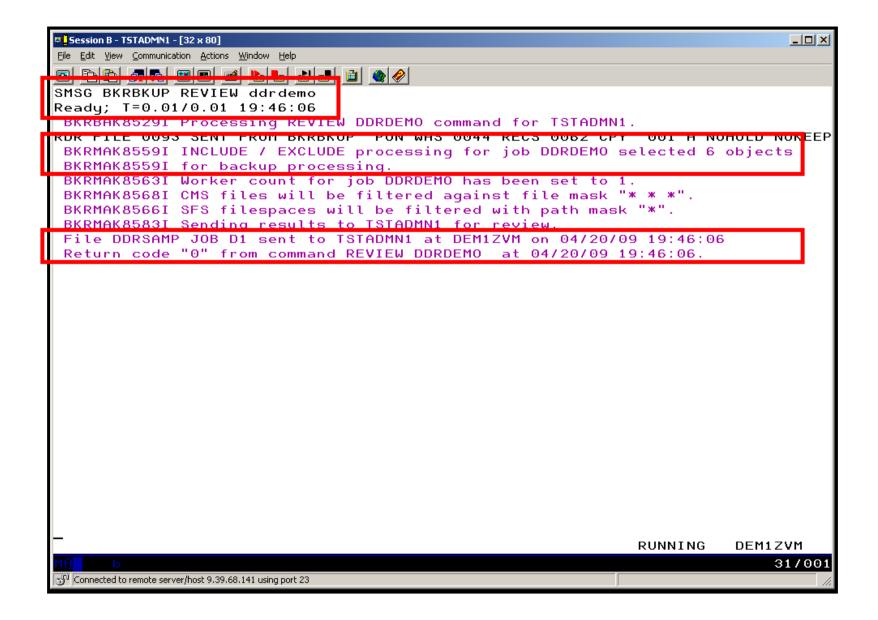
View the file(s) returned to you by Backup Manager

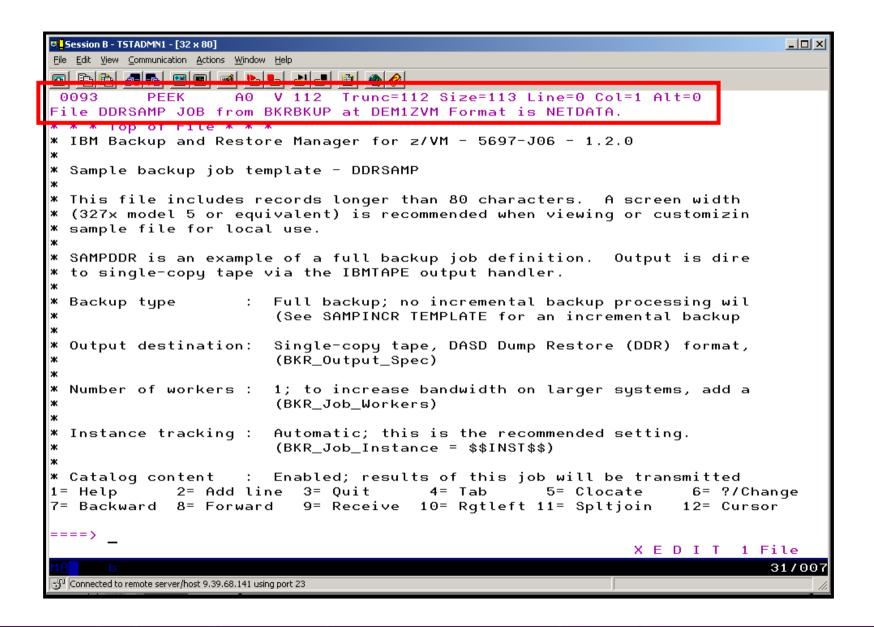
```
peek <rdrfile>
```

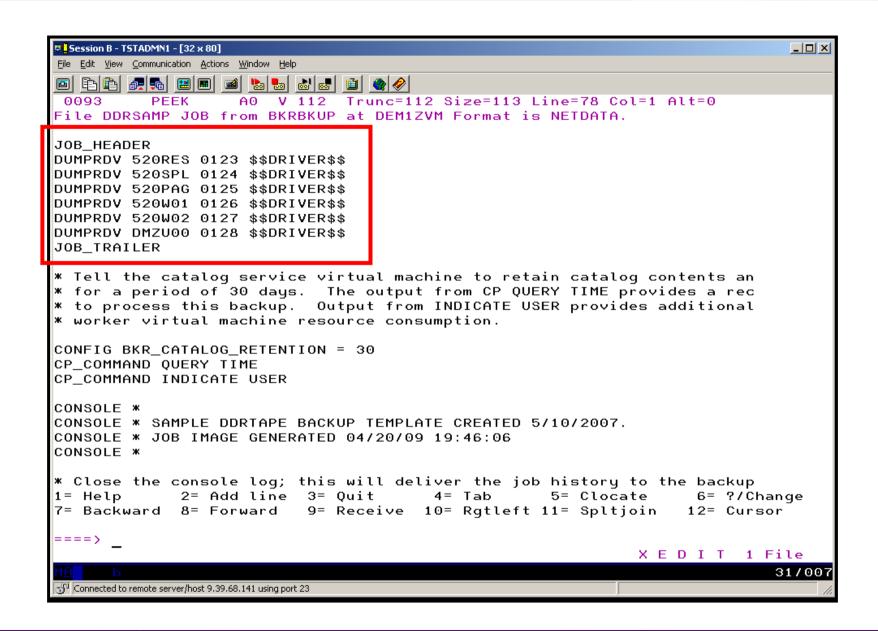












Scenario G: Reviewing data in the Backup catalog for recovery

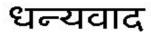
- Various backup jobs have previously been submitted and completed
- Full screen interfaces available for searching the backup catalog and finding data available for recovery
 - BKRLIST
 - Useful when looking for a specific file or set of files owned by a specific user ID
 - Users with ADMIN authority beware of size
 - Use parameters to narrow the search
 - BKRUSER
 - Useful when looking for backup jobs associated with a specific user ID
 - BKRJOB
 - Useful when looking for backup jobs by job name
 - BKRVOL
 - Useful when looking for backup jobs associated with a specific DASD volume

Scenario G: Detailed Steps

 From an authorized z/VM user ID, issue one of the following commands to browse the catalog

bkrlist bkruser bkrjob bkrvol

- Use F11 to drill down through details
- Use F10 to restore data



Hindi



Traditional Chinese

감사합니다

Korean

Спасибо

Russian



Spanish



Thank

You

Obrigado

Brazilian Portuguese



Italian



Danke German

Merci

French



ありがとうございました

Japanese

